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Undesirable Customers

By Henry C. Francis

How the price of any product is affected by the attitude of customers both before and after purchase—Tactics of undesirable customers

IT IS one thing to build a good machine and another to sell it at a profit. In fact the cost of selling sometimes equals that of labor and material. In some lines where large production is possible, the selling cost is frequently five or six times the cost of direct labor. And part, at least, of this cost is due to the buyers, or to a few of them. These few are the undesirable customers that almost every seller has and dislikes—but usually caters to.

What makes a customer undesirable? Briefly, it is the fact that he makes the selling effort so costly, so disagreeable and so unsatisfactory that the seller breathes a sigh of relief when the transaction is finally closed.

Much of this attitude on the part of some buyers probably comes from the fallacious idea that the buyer is conferring a favor on the seller. It is only when the demand exceeds the supply, as it did from 1916 to 1920, that the buyer realizes he is not exactly a philanthropist when he places an order for a machine that is a necessity in his business. Once in a long time he has a taste of the same dictatorial treatment that he gives the sellers of machinery in normal times.

What is perhaps needed more than anything else, is a realization, on the part of both buyer and seller, that a satisfactory sale is a *mutual transaction* where each gets value received. The maker of the machine sells his experience and labor in the form of an implement that will produce profitably for the purchaser. The builder of machines cannot use the machine profitably, and he sells because he needs the money to build other machines for other customers. And he must sell at a profit in order to secure capital and to develop new machines that will further reduce production costs. The user buys the machine because it can, all things considered, earn him a greater profit than he can get from his money invested in other channels. If he preferred the money to the machine, he would not buy, so that, in buying, he is doing himself fully as much of a favor as he is the seller. Many buyers forget this and seem to think that the seller should cater to them in every way; that he should send salesmen and engineers to be kept waiting in reception rooms, or standing in halls; that he should make changes without cost; that he should send service men free of charge at any time, no matter if the trouble is entirely the fault of the user's own men.

> If a machine builder must furnish an unwarranted amount of free service with each machine he sells, he is forced to increase his selling price in order to make a profit. Buyers of machines should realize how this adds to the cost of all equipment

Such buyers do not seem to realize that they are making it necessary for the machine builder to charge more for his product, that they are adding to the cost of the machines they, themselves, must buy. And, unfortunately, they are adding to the cost of machines bought by customers who do not add to selling expense in this way, but who now pay just the same.

There are many factors that tend to make a customer undesirable. One is continued delay in placing the order after he has practically decided to purchase. This delay is frequently not the fault of the individual in charge of purchase, but of the system under which he works. Sometimes budgeting, but more often absentee control, is responsible. Some railroads come under this head and are not considered desirable customers by machine builders, even though they go after the business. One machine builder claims that it takes a year to close an average railroad shop order after negotiations have been commenced. Another, that merit plays so little part that he'd be glad to flip a coin with the purchasing agent instead of taking the time to explain the good points of his machine, and take his chances. He might lose the order but he'd save a year's time and a lot of mental wear and tear.

Other undesirable customers ask for tool layouts and estimates, with never a thought of purchase, but to see how their present practice checks up. There are a surprisingly large number who see no breach of business ethics in requesting engineering information that costs

money to compile, and in permitting manufacturers to spend goodly sums on engineering and design, in the belief that there is a possibility of an order, when none exists.

In other instances, layouts and estimates are passed over to others to enable them to supply a substitute machine at a lower price. These cases are not common but they have been known, and in places where business ethics might be supposed to exist.

There is another factor that affects selling costs and of which the management, as a rule, knows nothing. This is where some shop executive demands an unwarranted amount of service, both engineering and mechanical, for which he expects to pay nothing. Two main reasons can be given for this attitude. One is that he is incapable of doing his own planning and demands the services of machine builders to help him keep his job. The other is to prevent accidents, due to his own men if not to himself, from being charged against his department. In either case the penalty is the same for the builder of machines if he refuses—opposition when it comes to new orders.

Every machine builder could give instances where gross carelessness in the operation of a machine has caused breakdowns. Spindles stuck from lack of oil, large milling cutters damaged because some one ran them backward by mistake, are all too common occurrences. But, instead of accepting the responsibility for themselves or their department, the user's men report the accident as though it were the fault of the machine, the office wires to the maker for service, expecting, and usually receiving, repairs without cost. The hundreds and thousands of dollars that makers spend in this way are charged to general expense, but they must find their way into the price of new machines, or the makers will have to go out of business.

Between Two Fires

The machine builder is frequently tempted to lay such cases before the management, but he seldom does. For he knows that even if he convinces the manager that the machine was not at fault, he has antagonized the foreman for life. And, if the foreman is dismissed for incompetency in this particular shop, he carries the animosity into other shops, and so spreads the poison which is virtually blackmail, but which cannot be prevented.

Managers as a rule, know nothing of such occurrences but if they did, would probably side with the foremen in most cases. But it is suggested, whenever a breakdown occurs on a standard machine, requiring a man to be sent from the factory, that the manager institute some quiet investigation as to the real causes of the accident. He will perhaps get information that may be of value in many ways.

While it is not easy to define all the factors that tend to make a customer undesirable, they can perhaps be summed up into the single phrase, that a customer is not desirable who needlessly increases the selling cost by business practices that are unethical according to today's standards.

Just how undesirable customers can be eliminated is a large problem. For, as long as the supply of a product equals or exceeds the demand, few makers can overlook the possibilities of making a sale. One of the points to be considered is that the desirable customers should receive better treatment than the undesirable. In too many cases the kicker, even though he be unfair and unreasonable, receives far better attention and service than the really desirable customer. The fact that "Jones never kicks" should insure him special consideration instead of neglect, as is too often the case.

Since all builders of machinery are also buyers, it may be well for them to do a little "introspecting" to determine whether or not they are on the other fellow's list of desirable customers.

Reason vs. Threats—Discussion

By R. B. Smith

A real thought has been contributed by G. B. Stewart in his article under the title given above, published on page 700, Vol. 64, of the *American Machinist*, to which the discussion by J. Homewood on page 943, has added materially. One more thought occurs to me, which may add somewhat to the discussion.

Manufacturing concerns spend thousands of dollars in advertising their product, that is, in "selling" their ideas to the public. In addition to advertising, they employ men whose special training enables them to sell the product to the customer. Yet it is only within a comparatively short time that the managements of these concerns have given any thought to "selling" themselves and the companies they represent to their employees. This may in some part be due to the lack of selling ability on the part of the employees themselves. The controversy between the factory and the sales force is probably age-old, and may reasonably be expected to continue, since the man in the shop is not in position to "sell" himself and thereby emphasize his importance to the management.

The perdition of the factory is receiving orders from someone higher up. The effect of the order from a psychological standpoint has been given little or no thought. More often than not, the actual wording of the order is left to someone in a minor capacity who, through lack of training and a lack of knowledge of human nature, is more apt than not to take the position that the brevity and forcefulness of the wording will reflect his ability to give orders, never stopping to realize that it is the effect of the order that proves its value.

Will Respond to Reason

As Mr. Homewood says, the average working man of today is a thinking man and will respond to reason far more readily than to threats. The percentage of the force that will willfully do anything detrimental to the welfare of the organization is extremely small and is generally out of favor with the remainder of the force.

When the manager realizes that his force as a whole means to do right, if shown the way and the reason for the various steps which must be taken, no threats will be issued. The rules that must exist will be presented to the force on a "sales" basis and when once "sold" will meet with a hearty co-operation never met with under the old system of threats.

Going Mr. Stewart one better I suggest that his notice be changed to read: In order that this property may be protected by insurance, it is necessary to eliminate all smoking, since it increases the fire hazard.

A notice thus worded will explain why the rule has been adopted, and it is not likely that it will antagonize the men.

Production Methods in an Ice-Machine Plant

By Frank W. Curtis
Western Editor, *American Machinist*

Boring twin-cylinder compressor units—Face grinding top and bottom surfaces—Turning crankshafts—Finishing crankpin bearings—Turret-lathe work—Testing the finished product

PRODUCING ice machines in quantity lots of 25 to 100 units, has enabled the Baker Ice Machine Co., Inc., Omaha, Neb., to apply production methods that permit the making of accurate, interchangeable parts. The company manufactures eleven sizes of machines, ranging from ½- to 75-ton refrigeration capacity, for use in markets, restaurants, or industrial plants.

The semi-steel compressor frames have their outboard-bearing pedestals cast integrally to eliminate the necessity for sub-bases. A casting for a twin-cylinder compressor is shown in Fig. 1, on an Espen-Lucas boring machine. The work is loaded and unloaded by means of a 5-ton electric crane and placed over a plug on a locating block. It is fastened by means of a U-clamp that fits through the crankcase. The projecting cylinder-head end is supported by means of an adjustable jack over which is placed an additional U-clamp. Radial alignment of the casting is secured by setting the ends of the cored cylinders so that an even amount of metal is removed from the sides.

A boring head, located on the machine table close to the work, carries two bars in order to bore both cylinders simultaneously. The machine spindle drives the lower bar and the latter is connected to the upper bar through a gear box located between the upright members of the head. Demountable boring and reaming heads are attached to the ends of the bars. The rough-boring heads are equipped with six inserted-blade tools, and they bore the cylinder to 3.400 in. from a

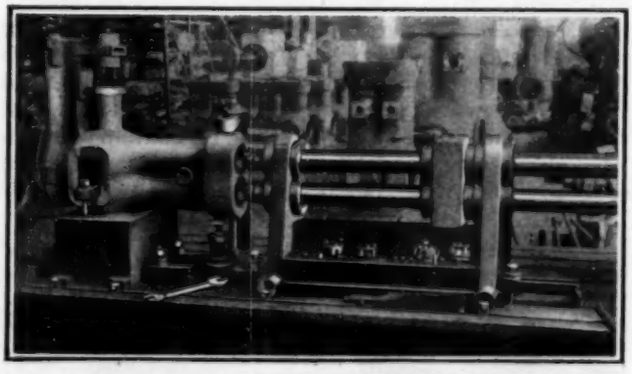


Fig. 1—Boring a twin-cylinder compressor

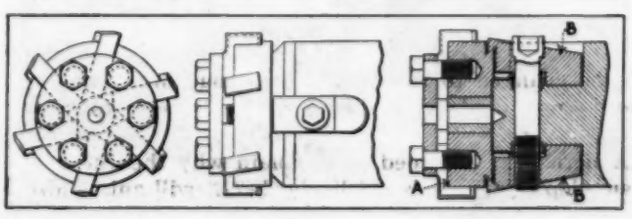


Fig. 2—Details of the boring tool

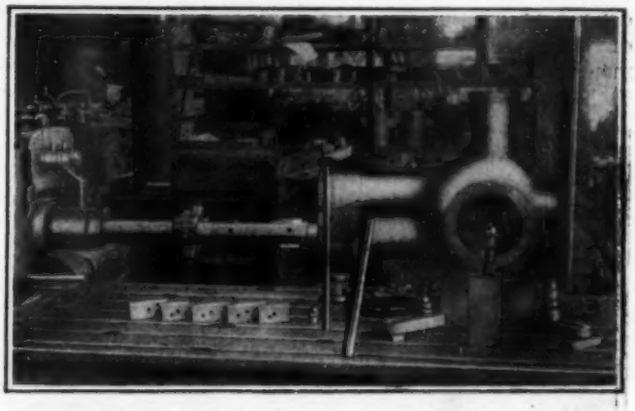
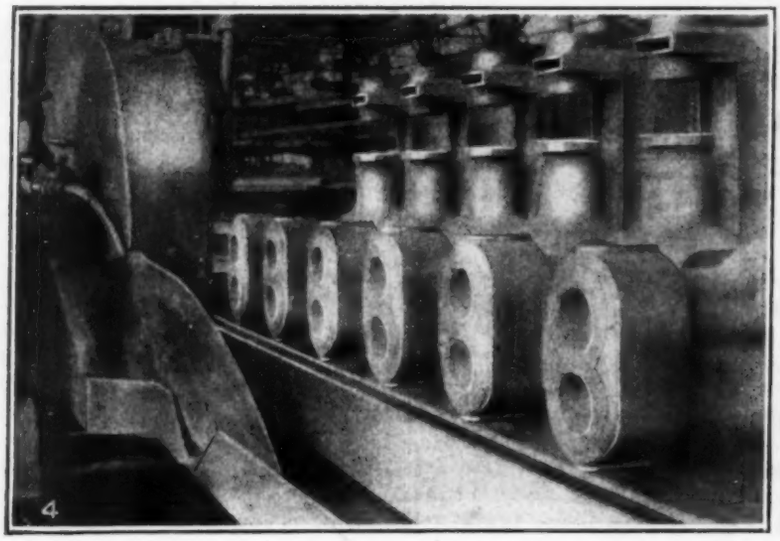


Fig. 3—Set-up for boring larger units

3½-in. cored hole. The semi-finish bore of 3.493 in. is made with a single-point boring tool, after which a reaming head similar in design to the roughing head finishes the bore to 3.499 in. The rough bore is taken at a feed of $\frac{1}{16}$ in. per revolution, the semi-finish bore at $\frac{1}{32}$ in., and the reaming cut at $\frac{1}{64}$ in. These operations are all carried out at 35 r.p.m. Parallelism between the holes is held to 0.001 inch.

Details of the rough-boring and reaming heads are shown in Fig. 2. The head body *A* is counterbored to fit over the end of the boring bar, thereby centralizing the head. Two clamps *B* hold the head in place. The change of heads can be made quite rapidly by this arrangement.

Larger frames are handled in a similar machine illustrated in Fig. 3, but the cylinders are bored separately. The work is located on a fixture over a plug that has an upright pilot on it to guide and to support the outer end of the boring bar. Kelly boring tools and reamers are used. The compressor shown is rough bored to 4⅞ in. and semi-finish bored to 4.490 in. It is reamed to 4.499 in. U-clamps and supports hold the work in place. A counterbore, 5½ in. in diameter is machined in the head of the cylinder by means of the boring head shown on the rear of the bar. The machine handles different sized units ranging up to 10½ in. in bore.



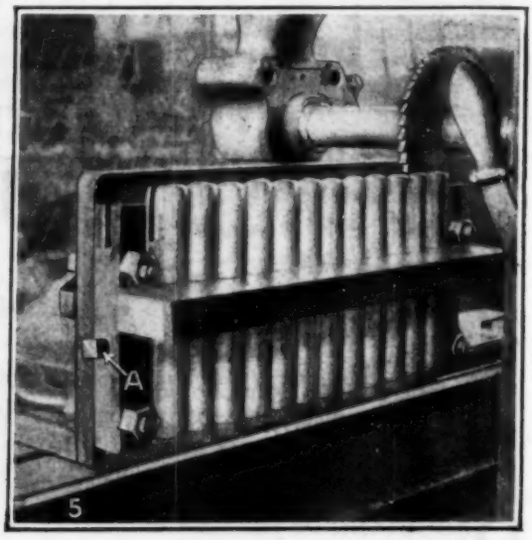


Fig. 4—Face grinding a set of compressors. Fig. 5—Gang slotting oil-pump plungers

Frame castings are face ground on the top and bottom surfaces in a Diamond face grinder. The work is mounted on the table in groups, the number of pieces depending on the size. In Fig. 4 is shown a set up of six 2¾-in., twin-cylinder frames. The work is mounted on a face-plate fixture that is reversible so that both ends are ground at one setting. Approximately 3.16 in. of metal is removed from each surface and the height is held to 21¼ in. A 12-section, 30-in., segment wheel is used. The wheel is dressed slightly for each set of the castings. The work is loaded and the fixture is reversed by means of an overhead crane.

Hand oil-pump plungers, made from 1⅛-in. cold-rolled steel, are slotted in gangs in the No. 2A Brown & Sharpe milling machine shown in Fig. 5. Twelve pieces are held in the fixture. The ends rest on a hardened locating plate. The flat clamp shown in the front end is tightened against the work by means of two setscrews on the rear of the fixture. End location is made by means of the setscrew *A*. A 6-in. saw, operating at 36 r.p.m. and at a feed of $\frac{1}{32}$ in., cuts a $\frac{1}{4}$x1$\frac{3}{16}$-in. slot in the work. An oil coolant is used.

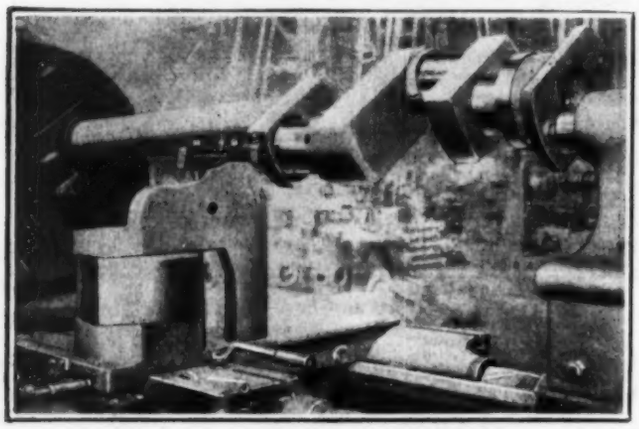


Fig. 6—Turning crankshafts

One of the larger sized crankshafts being turned on an American lathe that is equipped with raising blocks under the head- and tailstocks, is shown in Fig. 6. The special tool support used is built with a projecting arm so that it will have ample rigidity and clear the sides of the crankshaft when the pin bearings are turned. Solid tools can be mounted on the support as well as the Armstrong holder illustrated. The crankshaft is centered and turned on both ends, after which it is fitted with cast-iron center shoes that have hardened steel bushings into which the centers are fitted. The shoes, driven in place by means of a sledge hammer, are lined up with the crank throw by means of parallels. A counterbalance weight is mounted on the faceplate.

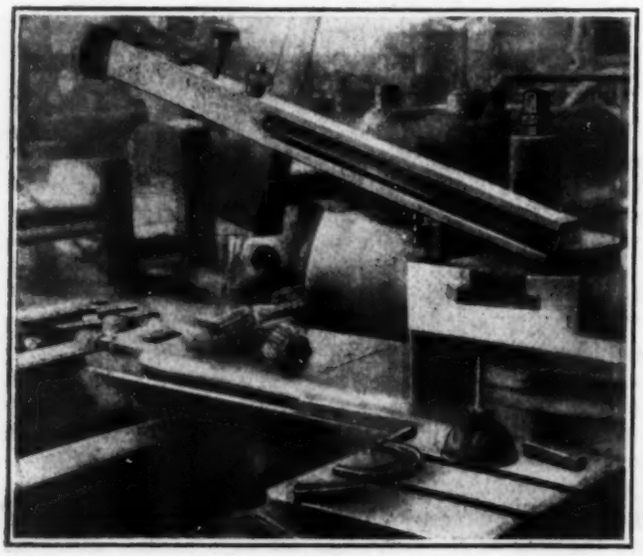


Fig. 7—Finish-turning crankpins

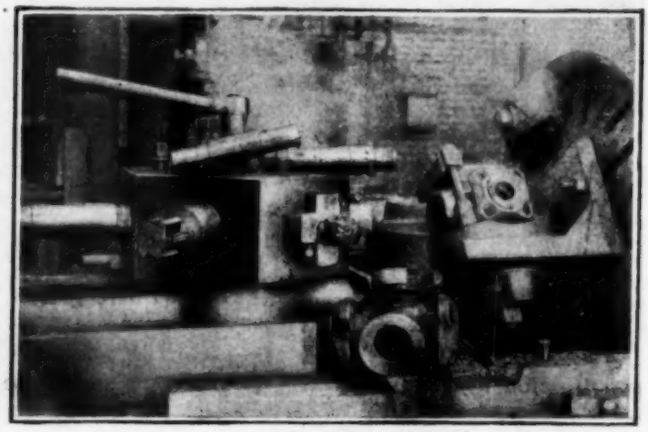


Fig. 8—Machining globe valves

Crankpins are finished as illustrated in Fig. 7. The crankshaft shown, for a 4½x4½-in. machine, is mounted on centers in a Le Blond heavy-duty lathe. The Sawyer-Weber crankpin turning tool, fitted on the pin bearing, is provided with a broad-nosed tool that takes a cut the entire width of the pin bearing. The turner is adjusted to the crankshaft so that the cutting tool and supporting block directly opposite, touch the work. As the work revolves, the cutting tool is closed in by the handwheel on the far end of the bar. The opposite end of the bar rests on a support that is mounted in the toolpost. By observing the path of the holder as it passes the setscrew on the end of the support, it is possible to determine if the work is being finished squarely, since any misalignment will cause an uneven movement. The shaft is finished to 4.4995 in., the size being checked by means of a micrometer. An oil stone is used

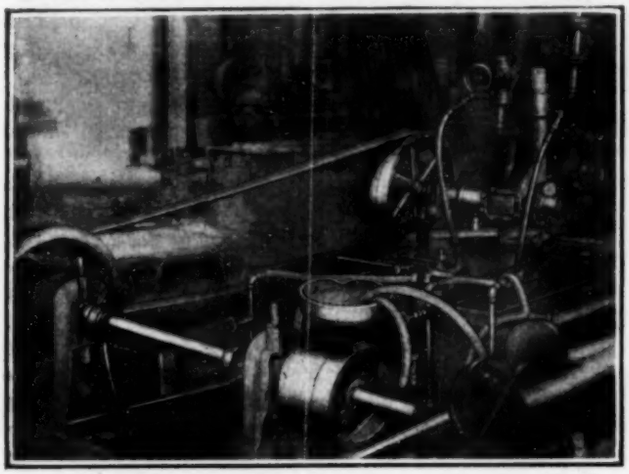


Fig. 9—Testing a complete unit

to remove burrs and to dress the cutter before each cut. The work revolves at 7 r.p.m. for the operation. A final finish is produced by means of fine emery cloth mounted in a wooden block that is operated by hand. The work is run through in lots of thirty to one hundred.

A turret lathe is used to machine cast-iron angle- and globe-valves for ammonia, and in Fig. 8 is shown a 1¼-in. valve mounted on an indexing faceplate that permits machining on both sides. The work is located in a fixture and held in place by the strap clamp shown above the work. The indexing is accomplished by loosening the nut on the bottom of the angle plate. This allows the revolving portion of the fixture to disengage from four beveled locating blocks. When the fixture is turned 90 degrees, the blocks locate in the corresponding new slots. The nut is then tightened. The work is similar on two sides, and is drilled, counterbored and faced. The bonnet ends are faced and bored for a 2½-in., 12-thread tap. The seat is bored to 1¼ in. A circular rib is machined on the face by means of a forming tool. The operation is completed in nine minutes, floor-to-floor time.

Completed units are tested as illustrated in Fig. 9. A pulley mounted on the drive end of the crankshaft is connected by belt to a countershaft that is driven from an electric motor. After the compressor has been run sufficiently to wear in the rotating parts, it is tested for compression by noting the length of time required to raise the tank pressure at a given speed. The units are then painted and assembled on the frames.

Seen and Heard

By John R. Godfrey

Paying for Advice

IT'S always more or less of a mystery how some people square their acts with the thing we call a conscience. When we go to a doctor we expect to pay for the advice and the dope we get, whether we take it or not. True, we sometimes let the doctor's bill slide till the flivver is paid for, because the doctor is usually as poor a business man as the mechanic and doesn't press us. But we usually pay him after a while.

When we see a lawyer about the neighbor's dog or chickens we come across at once. No checkee—no advice. The advance retaining fee is customary—and probably perfectly proper, although we'd call a doctor "hardboiled" who demanded money in advance.

When it comes to the engineer, however—he's the easiest mark out of captivity. He not only doesn't get it in advance, but he seldom gets it at all, even after the machine he helped to build is worn out. And it's mostly his own fault. He's begged people to come and let him give them all his experience so that he could perhaps sell them some sort of a machine later on and he never charged enough for the machine when he got the order.

In the meantime, there were perhaps a dozen other engineers all trying to force their experience on the same man, and for the same reason. Some of the ideas were very apt to be better than others, or the price of the machine lower, and the time spent by the other eleven was charged up to profit and loss—mostly loss.

This whole question of free advice needs overhauling. An engineer is very apt to have people he never saw call him up over the phone and ask for advice on machine equipment, or methods, or anything else. "We know you've had a lot of experience"—or "You have such a reputation as a practical man that we want your opinion on this matter"—or, perhaps, "Your friend Johnson tells me you know all about sausage grinders and he said you'd be glad to help us out," etc. And the average engineer falls for the "applesauce," gives the advice free, and eats his bread and butter plain.

I'm a great believer in exchanging ideas. But the engineer can't live on ideas any more than the lawyer or the doctor. And the swap is usually one-sided anyhow, he doesn't get any ideas in return for his—or any money either. There is no reason why anyone should expect engineering advice for nothing any more than any other kind.

When a firm wants to be dead sure of the best legal opinion it goes to several good lawyers for their advice. *And it pays them all.* It doesn't say, "We'll pay the one whose advice we like best." It lays down a check for each one and then decides who to follow.

Is there any reason why engineering advice is less valuable whether you use it or not?

Before you can tell what kind of a system or what kind of foremen are needed in a shop, you must know the mental attitude of the active man at the top. A broad-minded manager knows that he can secure the best results with a flexible system, and with foremen who are given considerable latitude in using their discretion.

The Automatic Indexing of Prime Numbers

By Henry J. Eberhardt

IT IS occasionally necessary to cut spur gears having a large prime number of teeth, when no change gear with the desired prime number of teeth is at hand. This operation can be performed on many of the hobbing machines, now in use, that have a differential mechanism in the indexing train. This method is not an approximation; it exactly divides the prime number desired. Were hobbing machine gear trains especially designed with automatic differential indexing in view, the mathematics required would be comparatively simple. It would ordinarily do to gear up for the nearest number of teeth to the required prime as shown on the regular charts, and to add or subtract one or more teeth by means of the differential change gears.

Hobbing machines, as regularly made, have their gear trains designed for helical or herringbone gear angles, and are such that a difference of one or more teeth from a desired prime number will require a gear train of such high ratio as to overstrain the shafts. This high-ratio gear train can be avoided by gearing up for a number varying but little from the desired prime. Instead of varying one or more whole teeth, a ratio is chosen for a fraction of a tooth difference. By this plan, a practical gear ratio for the differential mechanism can be found. The accompanying chart shows the gearing, as used on the Newark No. 3 hobbing machine, for generating prime numbers from 101 to 199 inclusive.

Chart for Selecting Indexing and Differential Change Gears for Prime-Number Indexing on Newark No. 3 Hobbing Machine

Prime Number	Index Gears For	Indexing Change Gears Driven	Comp'd	Driver	Differential Change Gears Driver	Comp'd	Driven
101	100¾	91	28			66	33
			62	24	100	50	
103	102 9/10	98	24			48	48
			63	30	96	60	
107	106¾	84	24			66	33
			61	24	100	50	
109	108¾	87	24			66	33
			75	30	100	50	
113	112¾	88	32			66	33
			82	24	100	50	
127	126¾	91	28			66	33
			78	24	100	50	
131	130 9/10	85	24			48	48
			77	25	96	60	
137	136⅞	90	24			48	48
			73	24	100	50	
139	138¾	90	24			66	33
			74	24	100	50	
149	148¾	85	24			66	33
			84	24	100	50	
151	150½	86	24			66	33
			84	24	100	25	
157	157½	90	24			66	33
			84	24	100	25*	
163	162¾	93	24			66	33
			84	24	100	50	
167	166⅞	90	24			48	48
			89	24	100	50	
173	172 9/10	95	24			48	48
			91	25	96	60	
179	178¾	110	24			66	33
			78	24	100	50	
181	181½	99	24			66	33
			88	24	100	25*	
191	190⅛	106	24			48	48
			90	25	96	30	
193	192⅛	104	24			48	48
			89	24	96	36	
197	196⅞	105	24			48	48
			90	24	100	50	
199	198¾	106	24			66	33
			90	24	100	50	

* Use idler

The regular indexing train is calculated for a gear having from a tenth to a half a tooth less, or, in two cases, a half a tooth more, than the desired prime. The fractional part of a tooth is either added or subtracted by means of the differential gearing. The principle of this operation is readily understood by inspecting the differential gear ratios. It will be noted that for a given fractional tooth, the differential gears are the same; and this is true whether the fractional part is to be added or subtracted from the number the regular indexing gears are set to produce the prime number.

In a hobbing machine, if a single thread hob is used, each hob revolution divides one tooth on the gear blank. When the machine is regularly geared up for 100¾ teeth, the differential gears are set so that the hob spindle is given ¼ revolution more for each revolution of gear blank; that is, the hob spindle actually revolves 101 times while the gear blank, or work spindle, makes one turn. On the machine for which this chart was made, the differential gear train produces a relation of 1/100 revolution of the hob spindle for each revolution of the work spindle, when the change gears are in a ratio of 1:1. Where the machine number of other hobbing machines is known, this chart can be varied proportionately. When using the differential train for cutting spur gears by this method, it must be kept in mind that the feed train, for giving cutting feeds in terms of work revolutions, is always directly connected, and it must be kept engaged to avoid spoiling the gear blank.

The Cost of Extra Care

By R. H. Kasper

Some foremen are known as cranks on the condition of the tools used, and "fly off the handle" if a workman breaks a drill or other small tool. No good mechanic likes to see tools abused, but, in many cases, the breaking of a small tool should elicit praise from the foreman, were all the conditions considered. One workman may work all day without breaking a single drill, while another workman, on the same class of work, may break several drills in the same time. In the course of a day's work, however, the second workman may produce twenty-five per cent more work than the first.

Now, if the daily wage of each man and the cost of the tools were added together, and divided by the number of pieces produced, in many cases the so-called careless worker would be found to be the most efficient. Sometimes a workman will spend two dollars' worth of time a day trying to save one dollar's worth of tools. This is greatly due to the attitude of the man in charge, who considers only the cost of the tools. Almost everyone concedes that the cost per piece is the important point, and yet many foremen lose sight of the fact that working the tools to the limit, and replacing more frequently, will in many cases reduce the cost per piece.

Gear Teeth in Action

By Earle Buckingham
Associate Professor of Engineering Standards and Measurements
Massachusetts Institute of Technology

Gear-lever analogy continued—Solving for tooth load when the horsepower and speed are given—Graphical analysis of tooth and bearing loads in typical gear-trains

IN ESSENCE, a pair of gears is but a combination of levers, the forces being applied through the teeth. Theoretically these teeth are of such shape that the point of application of the force is always at the pitch point, or the point where the two pitch circles are tangent to each other. The power transmitted by gears is always measured in terms of the tangential force at the pitch line, while involute gear teeth act at an angle to this tangent. It is therefore necessary to resolve this tangential force into its components in order to determine the actual loads on the gear teeth.

Fig. 7 is a diagram of a pair of involute gears where

r = pitch radius of pinion in inches
R = pitch radius of gear in inches
W = tangential force in pounds
P = pressure on gear teeth in pounds
α = pressure angle of gears
B = bearing pressure in pounds
A = force tending to separate axes of gears in pounds.

From the right triangle representing the components of the force of which P is the hypotenuse and W is one leg we have

$$P = \frac{W}{\cos \alpha} \text{ and } A = W \tan \alpha$$

In Fig. 7, the pinion is driving the gear in the direction shown by the arrows. If the gear were driving the pinion in the reverse direction to that shown, the diagram would remain unchanged. But if the gear were driving the pinion in the direction shown, or if the pinion were driving the gear in the reverse direction, the diagram would also be reversed, but the magnitude of the force and its components would be unchanged.

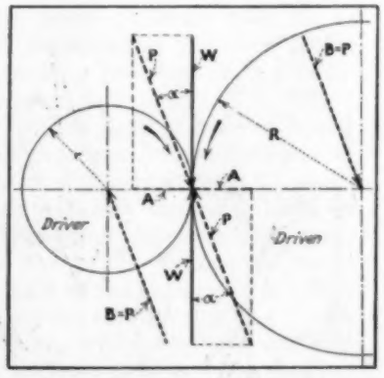


Fig. 7—Graphic representation of tooth and bearing loads

The line representing the stress B or bearing pressure as drawn in the diagram shows the direction of pressure on the bearings. There would be equal and opposite stresses in the bearings themselves, but these have not been shown.

The fourth article. The fifth will appear in an early issue.

A change in the pressure angle of the gears will change the tooth pressures and bearing pressures, but this change is not as great as it is sometimes assumed to be. A change in pressure angle from 14½ deg. to 25 deg. causes an increase in tooth and bearing pressure of less than seven per cent. The greatest change is in the direction of the pressure. The bearing pressure is often confused with the force that tends to separate the axes of the gears. This is but one component, however, and has no importance by itself.

The torque on the pinion shaft is equal to Wr in.-lb. and the torque on the gear shaft is equal to WR in.-lb.

When a pair of gears is required to transmit a definite amount of power at a specified speed, the first step is to determine the pitch-line velocity of the gears. When

V = pitch-line velocity in ft. per min.
r = pitch radius

$$V = \frac{2\pi r \times \text{r.p.m.}}{12}$$

The next step is to determine the tangential tooth load W at the pitch line. Usually the power to be transmitted is given in horsepower. In such cases,

$$W = \frac{33{,}000 \text{ hp.}}{V}$$

Sometimes the load to be transmitted is given as the torque load in inch-pounds. In such cases, if the torque on the pinion shaft is given,

$$W = \frac{\text{inch-pounds torque}}{r}$$

The first two equations can be combined so that it is not necessary to calculate the pitch-line velocities independently. Usually, however, it is necessary to know the pitch-line velocities in order to select suitable working stresses for the material in the gears. These first two equations combined will give the following:

$$W = \frac{63{,}025 \text{ hp.}}{r \times \text{r.p.m.}}$$

We will take as a definite example a pair of gears that are to transmit 10 hp. The pitch diameter of the pinion will be 4 in. and that of the gear will be 16 in. The pinion is to revolve at 2,000 r.p.m., and the pressure angle of the gears will be 20 deg. This gives us the following values:

r = 2.000 in.
R = 8.000 in.
α = 20 deg.
r.p.m. = 2,000

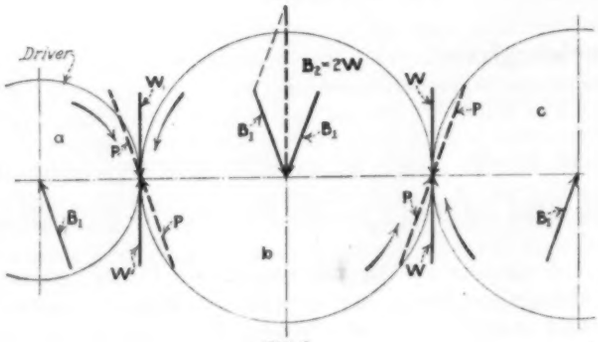


FIG. 8

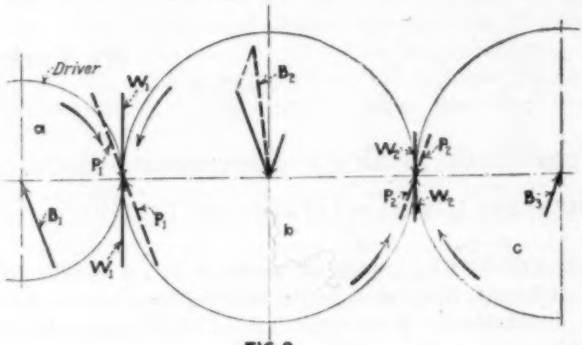


FIG. 9

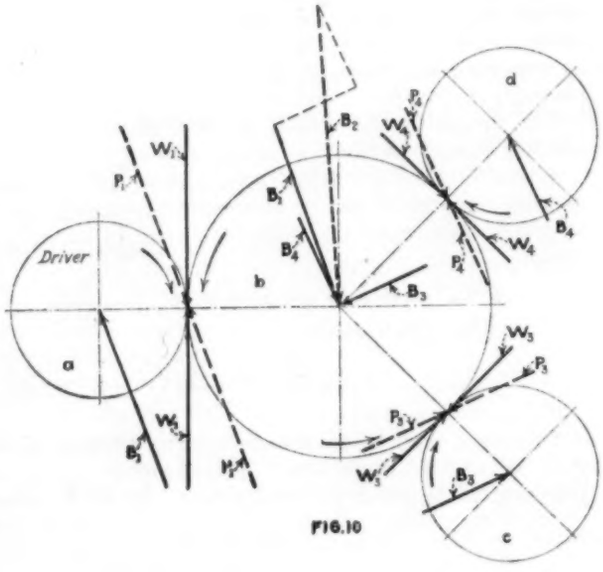


FIG. 10

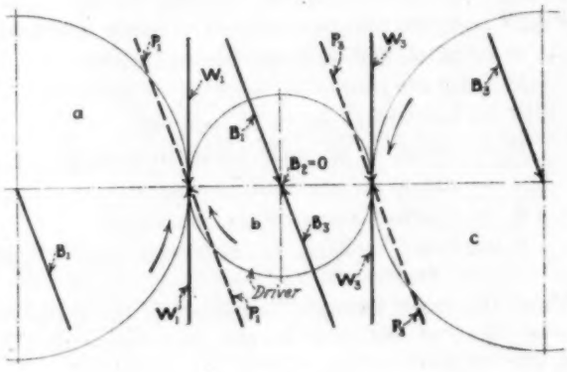


FIG. 11

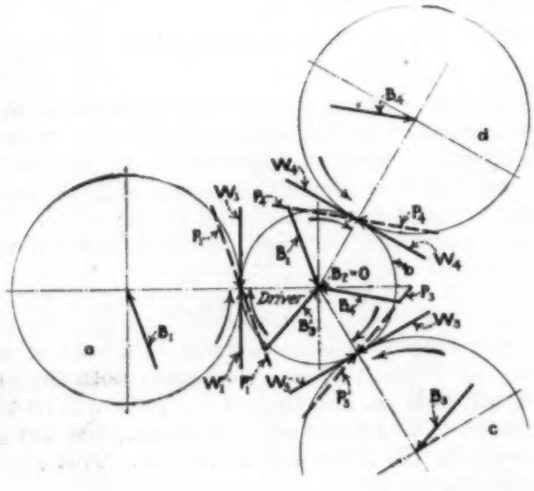


FIG. 12

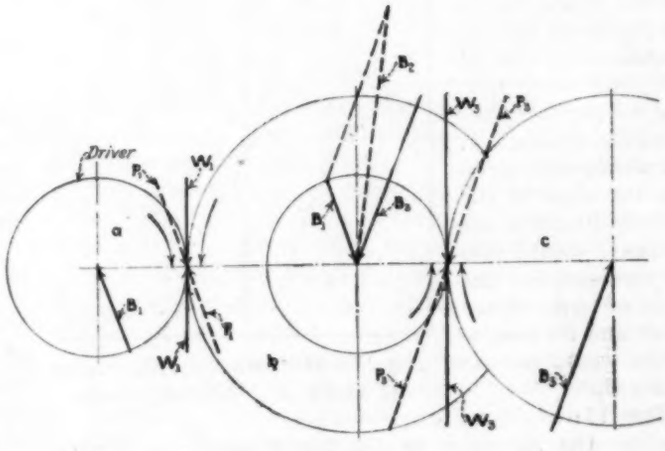


FIG. 13

Typical gear train problems

Solving for the pitch-line velocity, we have

$$V = \frac{4\pi \times 2{,}000}{12} = 2{,}094 \text{ ft. per min.}$$

Solving for the tangential or transmitted load, we have

$$W = \frac{33{,}000 \times 10}{2{,}094} = 157.56 \text{ lb.}$$

Torque on the pinion shaft = $157.56 \times 2 = 315.12$ in.-lb.

Torque on the gear shaft = $157.56 \times 8 = 1{,}260.48$ in.-lb.

Solving for the actual pressures on the gear teeth, we have

$$P = \frac{157.56}{0.93969} = 167.67 \text{ lb.}$$

The bearing pressures for both the gear and the pinion are equal to this tooth pressure of 167.67 pounds.

Friction has been ignored in all of the foregoing. It is not necessary to consider the tooth friction except when long trains, planetary or differential gear trains, or large amounts of power are involved.

Except for the bearing pressures, the same analysis as used for a single pair of gears is also used for simple trains. The bearing loads, however, must be analyzed individually in order to determine the resultant when two or more gears mesh with another. A train of three gears with their centers in a straight line is shown in Fig. 8. In this example, the pinion *a* is driving the intermediate gear *b* in the direction shown by the arrow, and this intermediate gear drives the last gear *c* in the train. As gear *b* is an idler, the tooth loads between gears *b* and *c* will be the same as those between *a* and *b*. The tooth pressure *P* is equal to $W \div \cos a$. The bearing pressures for gears *a* and *c* are also equal to *P*, the same as in the case of a simple pair as both of these gears have but a single mesh.

Bearing Loads

The bearing pressure on the intermediate gear *b* is the resultant of the two bearing pressures that result from the two gear engagements. This resultant, as will be seen from Fig. 8, acts in a vertical direction down on the bearing, and is equal to $2W$. This value of *W* would be determined as before. If, in this example, gears *a* and *b* were the same as those used as an example of a single pair, transmitting the same power at the same speed, the bearing pressure on the intermediate gear *b* would be equal to $2 \times 157.56 = 315.12$ lb. In effect, this intermediate gear is a lever loaded at both ends, so that the pressure on the fulcrum, or bearing, is equal to the sum of the two loads.

As another example we will take the same train as shown in Fig. 8, but in this case the intermediate gear *b* will transmit one-half the power it receives to its shaft and the remaining half to the third gear *c*. This will give the conditions shown in Fig. 9. The transmitted load W_2 between gears *b* and *c* will be one-half of the load W_1 transmitted from *a* to *b*. The bearing pressure for gear *b* will be the resultant of the two bearing pressures that result from the two gear engagements. If the load transmitted to gear *c* were less than half the original load, the lengths of the lines representing the forces would be correspondingly shorter, while if the load transmitted to gear *c* was more than half, the lengths of these lines would be correspondingly longer.

As a further example of the analysis of the loads that are present with a train of gears, we will consider the case where the intermediate gear acts as an idler to drive two other gears, thus making a train of four gears. We will assume that one-half the power delivered to the intermediate gear is transmitted to each of the driven gears. In Fig. 10, this train is shown.

Gear *a* is driving in the direction shown by the arrow, transmitting the load W_1 to gear *b*. This load is divided equally between gears *c* and *d*. The lengths of the lines representing the forces W_3 and W_4 are proportional to the amount of power transmitted to the respective gears, and the sum of these two forces is equal to the original force W_1. The bearing pressure B_2 is the resultant of the three bearing loads B_1, B_3, and B_4 that result from the three gear engagements. In all cases it is necessary to make an individual analysis of the bearing pressure on any gear that meshes with more than one other gear, and the simplest way to make such an analysis is to make a layout, with the lengths of the lines representing the forces proportional to the magnitude of the forces, such as one inch equals 100 lb., or 1,000 lb., etc., as the case may be. The resultant of these forces can then be measured and converted into the load in pounds.

Center Driving Gear

We will now consider the conditions that exist when the driving gear is the middle one of three gears in a straight line, transmitting an equal amount of power to the two driven gears. In Fig. 11, such a combination is shown.

In this example, the bearing pressure on the driving gear *b* is the resultant of two equal and opposite pressures and is therefore equal to zero. If more power was transmitted to one gear than was transmitted to the other, these two pressures would remain opposite, but not equal. In such a case the resultant would be the difference between the two pressures.

If the central driving gear drives three other gears equally spaced about its circumference, transmitting the same amount of power to each of the driven gears, we would have the conditions shown in Fig. 12. In this example the pressure on the bearing of the driving gear is the resultant of three equal pressures and is also equal to zero, as may be seen from their diagram in Fig. 12.

The power transmitted by gears is the product of the tangential tooth load and the pitch-line velocity. Thus in a reduction train of gears transmitting a fixed amount of power, the tooth loads will increase as the pitch line velocities are reduced. The pitch-line velocities of two gears mounted on the same shaft and revolving at the same rate of speed is directly proportional to their pitch diameters. Thus the tooth loads on such gears are inversely proportional to their pitch diameters.

A train of reduction gears is shown in Fig. 13. If the pitch diameter of the intermediate pinion is one-half that of the intermediate gear, the tooth load on this pinion will be double the tooth load on the intermediate gear. The pressure on the bearings of the intermediate gear and pinion will be the resultant of the two pressures as shown in the diagram.

Our export trade in 1925 was 37 per cent greater than in 1913. Of this increase the manufactured products hold the highest place in spite of this being the most competitive branch of export.

Book Reviews

The Technique of Executive Control. By Erwin Haskell Schell. One hundred and forty-three pages, 7½x5 in., cloth boards. Indexed. Published by the McGraw-Hill Book Co., Inc., New York City. Price $1.75.

Much has been written on the subject of the executive and his duties, but few writers have been able to compress in so short a space such a comprehensive exposition of the subject. The author believes that executive control is an art, the technique of which must be learned the same as that of any of the other arts, and that too much reliance cannot be placed on the old belief that executives are born to their jobs.

The book is a text on the subject, taking up in paragraph form the various attributes of the ideal executive, and suggesting how each may be developed. Questions of a practical nature are given at the end of each outline. These questions are intended to aid the reader in applying the methods to his daily work. The index of paragraph subjects at the end of the book forms a convenient reference. The book should be a valuable aid to any executive.

Business Annals. By Willard L. Thorp and Wesley C. Mitchell. Three hundred and eighty pages, 6x9 in., cloth covers. Published by the National Bureau of Economic Research, Inc., New York City. Price $4.

This book is a summary of business conditions in seventeen countries. The tables and yearly business and economic analysis extend through a considerable period, those pertaining to the United States and England running back yearly to 1790. Each year of this extended period is summarized as to economic conditions: industrial, commercial, labor, money, security, foreign exchange, agricultural production and prices.

The cyclical character of business fluctuation and the duration of business cycles is thoroughly discussed. The interesting fact is brought out that American business cycles have a shorter duration than those of any other country studied.

For those interested in the study of business and industrial trends, in the probable extent of the present period of prosperity, and the period of decreased industrial activity which must follow, this book will prove of interest.

The Internal Gear. Design and Application. Seventy-five 6x9-in. pages, paper covers. Illustrated. Published by the Fellows Gear Shaper So., Springfield, Vermont.

As explained in the secondary title, this booklet contains a simple but practical analysis of the comparative tooth action of internal and external gear teeth, together with directions for cutting, data on designing, and calculations of gear tooth strength. Although the method of cutting the teeth outlined is the one involving the use of the Fellows gear shaper, the presentation of the text is by no means in the form of advertising literature. The various phases of the subject are treated in a thoroughly technical manner, as in the case of similar booklets published by this company. The information is authoritative and is in keeping with the most advanced knowledge of gear tooth action. In brief, this work should make a valuable addition to the technical library of either the designer or the manufacturer of gears.

Chapter I deals with the definition and the advantage of the internal gear, while Chapter II treats of its design and manufacture. A graphical analysis of gear tooth action follows, then a study of internal helical gear design, the strength of gear teeth, and finally the graphical method of generating an involute tooth. The text is amplified by many line cuts and some photographs.

On the Metallurgy of Iron and Steel. By F. T. Cisco, Dr. Bengt Kjerrman and Birger Egeberg. One hundred ninety-three pages, 6x9 in. Published by the American Society for Steel Treating, 4600 Prospect Ave., Cleveland, Ohio. Price, paper cover $1, cloth binding $2.

The subject matter of this book, reprinted from the transactions of the American Society for Steel Treating, 1925 and 1926 sessions, includes information relative to the production of iron and steel. The authors have presented the descriptions as non-technically as possible, without affecting their scientific value, so that the data can be used by the novice as well as the experienced metallurgist. Many of the processes described are made possible from developments that have involved considerable research.

The book is divided into three parts: "The Metallurgy of Iron and Steel," "Some Comments on Swedish Steel Practice," and "On Electric Steel Melting." The first part, constituting the greater portion of the volume, has eight chapters that bear on the various phases of iron and steel making. Manufacture, mechanical treatment, and the chemistry of iron and steel in its different forms are included. The second part emphasizes the quality of Swedish steel that is obtained by relatively small-scale operation and by attention to details. The third part deals with the electric-furnace practice of converting pig iron and scrap metals into steel.

The book should be of value to metallurgists and to those who want a concise treatise on iron and steel making.

Of Many Things. By Otto H. Kahn. Four hundred and thirty-seven pages, 6x9 in., black cloth boards. Published by Boni & Liveright, 61 W. 48th St., New York City. Price $3.

Chiefly a collection of essays and addresses by Mr. Kahn, but containing an article on Edward Henry Harriman reprinted from a previous book, and an article concerning Theodore Roosevelt not previously published.

Part one deals with American art, parts two and three with business and economics. It is because of the value of the book as a treatise on business and economics that it is reviewed here.

The soundness of principle, the broadness of view, of the famous banker, cannot be questioned. For the business man who wants to conduct his business with a knowledge of the principles underlying national and international problems in economics, finance and culture, Mr. Kahn's book will be of great help. Incidentally, no small measure of cultural information may be acquired.

Automotive Production

How Production Methods Vary in Shops Building "Light Sixes"

By Fred H. Colvin
Editor, *American Machinist*

THE machining of the transmission case of the Cleveland car involves a number of shop problems, and the fixtures that have been designed and built for the work are somewhat unusual. One of the first operations is done, as in Fig. 1, on a No. 3 Cincinnati vertical machine, using an indexing fixture.

The case is held on a double fixture, the bar *A* being ready to receive the second case. The lower part of the transmission case proper, as at *B*, is supported by a pad similar to the one at *C*. The stop screw *D* holds the case against any tendency to turn on the bar under the thrust of the cutter.

A large Warner & Swasey turret lathe is used to bore the case for the main shaft bearings as in Fig. 2. The large pot chuck encloses the case, and supports it firmly during the boring operation. The hole is rough- and finish-bored, and reamed to receive the bearing shells.

Locating from the bored hole the case is drilled in the double-headed Munson machine in Fig. 3. Both heads feed toward the work and all the drills are guided close to the case.

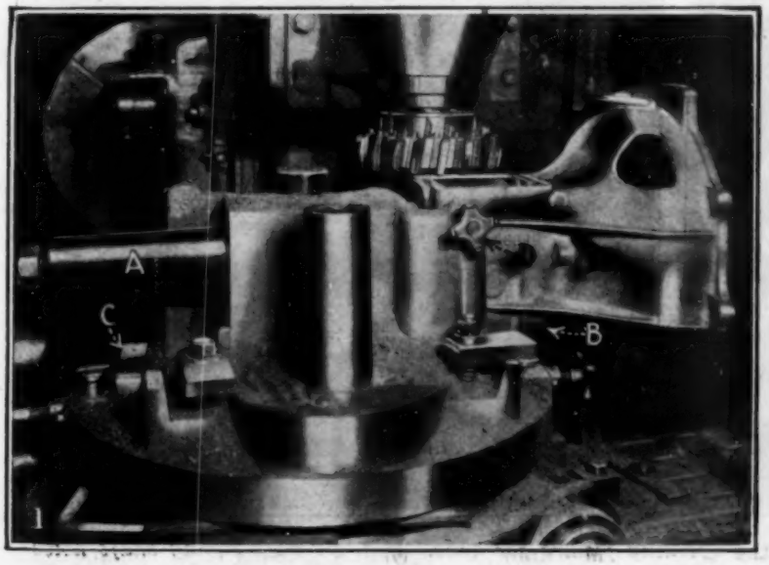
Milling the ends of the case requires a rather unusual fixture as in Fig. 4. The case sets into a suitable shaped opening, a mandrel *A* centering it from the bored hole. The face for the cover, milled in the first operation, is used to square the case and hold it level. The clamp *B* holds this part of the casting.

The outer- or bell-housing end is supported by set-screws such as at *C*, and by a bottom stop operated by screw *D*. An unusual feature is the brace *E* that fits over the two bolts *H* and holds the case down on the lower stop by means of the point *I*. At the same time the screws *K* in the upper ends of the brace, hold the ends of the flange against the cut. In this way, a thin section of large diameter, is held against vibration from the cutting action of the large milling cutters, so that a good surface is secured and both ends are kept square with each other. The machine is a Garvin duplex.

The holes in the ends of the base have to be spot- or back-faced on the inside and to the correct distance. The gage in Fig. 5 shows when the distance is right When the bottom check nut rests on the lower fork of the gage, as shown, the bar is in such position that the cutter can be inserted without contacting with the work. The spindle is then fed upward until the short upper fork will slide under the lock nut *A*. If desired, such a gage could be used to show limits by setting the nut *B* to indicate the highest permissible point.

To insure squareness between the face of the bell

The eleventh article. The twelfth will appear in an early issue.



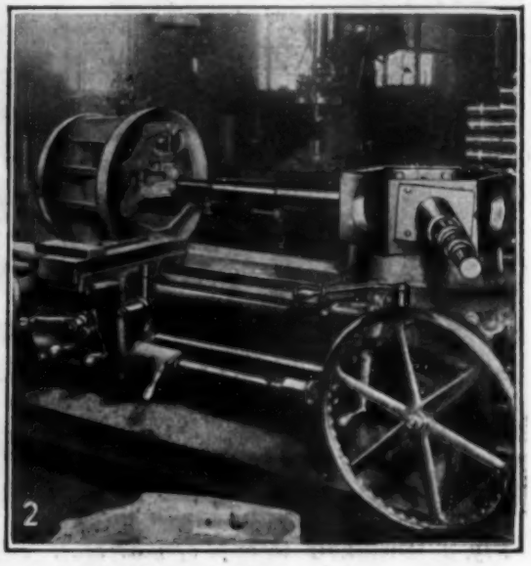
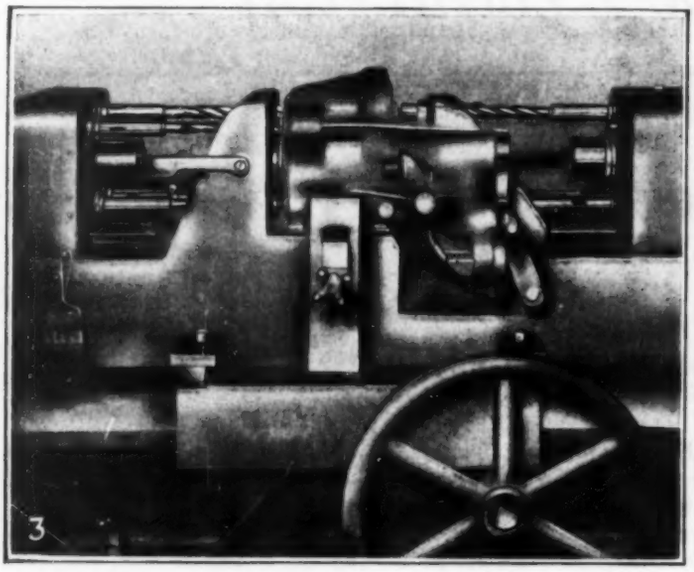
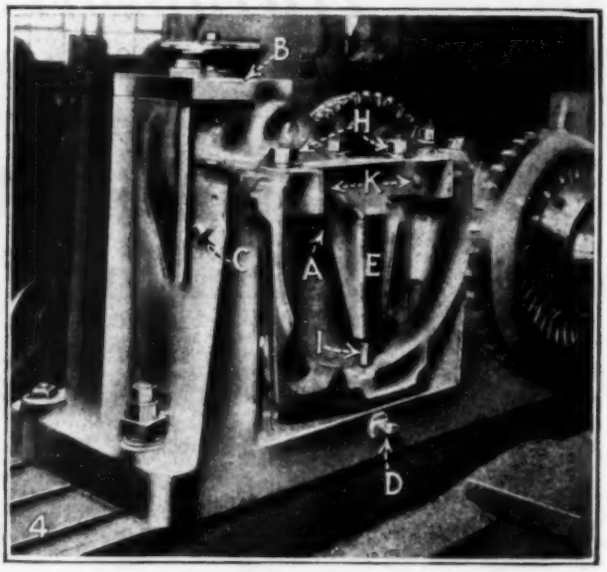


Fig. 1—Milling gear cover seat. Fig. 2—Boring for drive shaft

Automotive Production

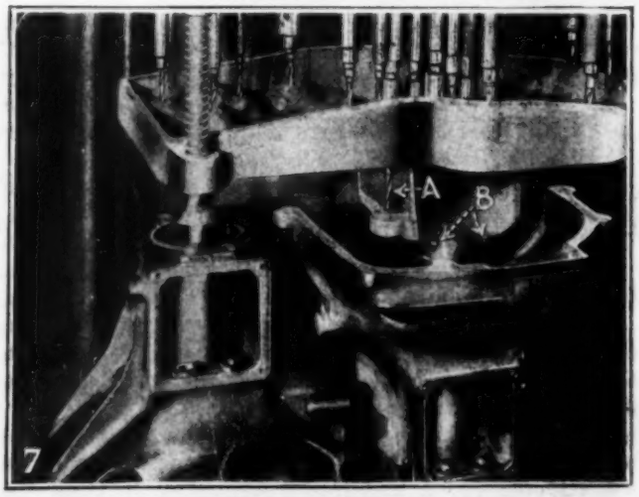


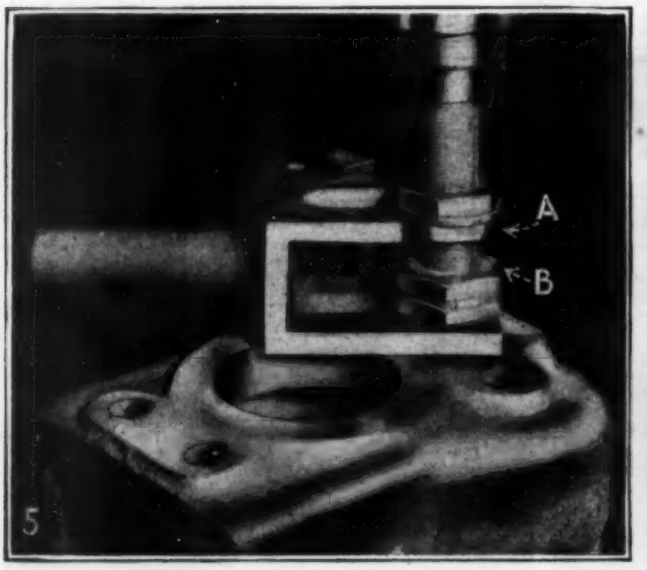


housing and the bore, the case is mounted on a mandrel and the end of the housing is faced in the lathe as in Fig. 6. This method illustrates one of the fixed principles in machine work that seems to be necessary to secure the desired accuracy.

In the double drilling fixture shown in Fig. 7, opposite ends of two cases are drilled at the same time, giving a complete case at every cycle of the drilling machine. Both cases are mounted on mandrels as shown, each mandrel acting as a guide for the bushing plate above.

A careful study of the way in which the drills are arranged and grouped is of interest. The left group, for the end of the case at the left, is a simple matter. But the other group makes quite a study. First there are the outer rows that drill the holes in the flange. Then there are drills as at *A* and *B* that reach down inside the case and drill holes in the gear case proper.





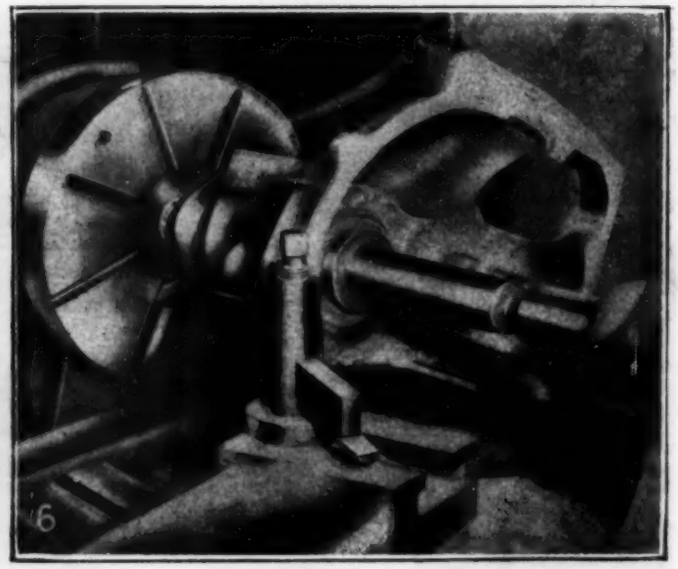


Fig. 3—Drilling both ends of gear case. Fig. 4—Milling fixture for ends. Fig. 5—Back facing shaft holes
Fig. 6—Facing end of case in lathe. Fig. 7—Double drilling fixture for bolt holes

Address of President to National Machine Tool Builders' Association

By H. M. Lucas
President, The Lucas Machine Tool Co.

Standardization activities must be supported —Salaries, wages, and profits should be on higher level—Proper cost systems are necessary

AS THIS association is nearing the completion of twenty-five years of activity, it is of interest and profit to take stock of ourselves as an association. When this association was formed, competition in this industry was of the cut-throat variety. Business standards were low. Trade rivalry was marked by unintelligent and ignorant underselling. Quality of product was being sacrificed to price. Unfair methods of all sorts were used in a vain hope of getting business at a profit. No individual action could cure the evils of that sort of competition, so men naturally joined together to discuss and remedy these evils if possible.

The records of the conventions of all these years contain many papers and discussions of value, suggesting constructive policies that were never carried out because the industry was too loosely organized and therefore could not carry out any project requiring sustained effort. At the annual meeting of 1903, when the association was but a year old, Mr. Lodge, in his presidential address, advocated the adoption of standards that would facilitate interchangeability of face plates, chucks, and tools from one machine to another, irrespective of the make of the machine. He pointed out "that this would be a most important matter not only for ourselves, but to the men to whom we sell." After twenty-three years, Mr. Lodge's vision still remains among the things to be done. In 1903, it took a bold man indeed to propose such standardization. In 1926, it is only a very stubborn man that will try to resist the demand for standardization that has grown up.

Need to Perpetuate Manual Skill

In 1907, the association adopted a machinist apprenticeship contract, and since that time has been providing engraved diplomas to be given to the apprentices on the successful completion of their terms. However, apprenticeship seems to have fallen into very much less favor than was current then. Some few of our members continue to call for the association diplomas, but the number now issued each year is almost negligible. It may be that we do not need apprentices under present-day conditions as we needed them in 1907, but we certainly do need to perpetuate the manual skill required in the production of machine tools. Whether this perpetuation is to be obtained by apprenticeship, or by some other method, is a problem of the industry today.

Excerpts from address delivered at the 25th Annual Meeting of the National Machine Tool Builders' Association, Lenox, Mass., Oct. 4-6, 1926.

During those years, there was much talk and some work on the problem of getting the industry to keep sensible, necessary cost records. Not all plants have such records even now.

Since the association established a permanent office in 1921, with a full-time staff engaged for the service of the industry, we have been able to do many things much better than before. Our association is now recognized as the authoritative source of information on every conceivable problem affecting the machine tool industry.

Codes of Conduct

In all their relations with each other, men must necessarily be governed by codes of conduct, written or unwritten. These codes grow out of human experience that shows men what sort of conduct makes relationships the most happy and agreeable, as well as showing what sort of conduct makes their mutual relations unhappy and disagreeable. In the light of these experiences, men are respected by others according to the way they act. It has not been necessary, up to this time, for our committee on trade practices to function in any specific cases.

Our latest activity, and it is one of outstanding importance, is to undertake the task of conducting the machine tool industry's own exposition. This marks the beginning of co-operation by American builders in constructive merchandising, and in the reduction of competitive marketing waste.

We know that the right kind of exposition has a proper place in the industry's marketing plans. But, heretofore, none of the expositions in which machine tools have been displayed has quite filled the specifications of what we need. Moreover, a multiplicity of expositions, none of which are quite of the right kind for us, simply meant much competitive waste of time and money. So there was every good, sound reason for our association to give the industry the kind of exposition it should have, and could not get elsewhere. Our exposition has the enthusiastic, whole-hearted support of the members, without whom no machine tool exposition can be a success. Therefore, it is our belief that the first National Machine Tool Builders' exposition will have the most representative and the most complete display of machine tools that has ever been made.

We should seriously consider the problem of placing the machine tool industry at least on the same level of respect that is held by those industries that could not exist without our tools. It seems to me that we are

held below this proper level because salaries, wages, and profits in our industry are not on a par with those of other metal working industries. It also seems to me that we shall not receive the respect our industry deserves, until we put these items upon a par with similar items in the industries of our own customers.

This industry, on which all others depend for reduction in costs of production, should be able to enlist and retain in its ranks, the best of engineers, the best of salesmen, the best of executives, and the best of workmen. To do so, it must be able to pay all such men at least as much as other industries will pay them.

The mortality study of our industry recently sent you, indicated that in this industry there is a high and constant yearly death rate among adult, well-established concerns of all ages. Look over those concerns that died and note how many of them have begun to sicken on the day they lost one man whose individual talent had built them up to relative prosperity. Look about this industry today, and note how few of our successful concerns are over thirty-five years old, and whose management is therefore in the hands of a competent second generation of management. It is a serious and pressing problem to enlist, train and keep the sort of personnel that the industry requires under present conditions. The bed rock foundation for the solution of that problem lies in providing adequate compensation for such a staff.

Continuous Development of New Machines

With the possible exception of the automobile manufacturers, the machine tool builders have devoted more time than any other group of machine manufacturers, to developing, designing and building new and better machines. Our new machines perform intricate and accurate operations at an almost unbelievable rate. New methods have been devised by us all for saving time in the making of all kinds of machinery and metal goods. The pressure for still better methods is so strong that the new machine of yesterday becomes obsolete almost tomorrow, by reason of the initiative and activity of some wide-awake builder of machine tools. In contrast, there are other machine building lines that have developed almost no improvement in the ten or more years past. Yet these industries can and do secure a higher percentage of return than ours, in which so much brain work, labor and capital are being expended.

The machine tool builder's customers have no merely sentimental interest in him. It is none of their immediate concern if he fails to secure the return necessary to maintain and develop the industry on which their own future largely depends. It is part of the machine tool builder's own job to collect that return himself. If he is negligent in doing this, no cry for sympathy will prevent his business being ground to pieces by the economic steam roller. Therefore, I raise no cry for sympathy, but I do ask you to consider these cold facts.

For many years the machine tool industry has been noted for relatively low compensation of its whole personnel, as well as for relatively low returns on its capital, and relatively high risk and business mortality. While this has always been extremely important to our industry, it has not been of much importance to the industry's customers. In days past, their own needs for simple, rough-and-ready machine tools of low productivity could be met, and were met, by the starting up of new shops faster than the old ones failed.

Builders of other machines, who aim to go on building the same machine in quantities year after year, well know that you who devise new machines make it possible for them to cut their costs, and increase their profits. It should not be difficult to convince them that you deserve not only a respectable, but a generous return for your effort.

Mass production makes increased profits for your customers. But, as Dean Kimball has pointed out, mass production is impossible without men who can transfer skill and intelligence from men to machines. Those who can produce consumer goods on the mass production system can therefore well afford to pay adequate compensation to men who have the faculty and facilities for producing the machines that make mass production and larger profits possible. The consumer who gets an increased supply of goods at lower and lower prices, certainly will not and cannot begrudge adequate compensation to the builders of the master tools that make those goods. Today's mass production cannot be attained with the simple, rough-and-ready, low-production tool of even ten years ago. And the more complex, more accurate, high-production tool that industry needs today, cannot be supplied in the quantities needed, by the small, poorly organized and poorly equipped machine tool shop that sufficed to supply machine tools in pre-war days. So if they are to earn the larger profits made possible by mass production, the machine tool using industries must necessarily pay prices that will permit machine tool shops to become as large, as well manned, as well equipped as is necessary to furnish industry the tools it needs today. The machine tool builder, however, cannot assume the risk of the larger capital invested in such shops, nor risk the cost of further progress in design and development, unless he secures a price high enough to compensate him for the greater risk and greater effort that his customers call on him to make in their behalf.

The machine tool industry must fail to do its full share in advancing civilization if it does not secure prices that generously reward its work. . . . Each of you must individually study your own business, find out what your true costs are and determine what price policy is proper for your own business.

Fair in Buying as in Selling

There is another thing that we must remember in this connection and that is that only a poor rule does not work both ways. In other words, if we expect to maintain our prices as sellers, we must not try to beat down the people from whom we buy if their prices are fair.

Let us have proper cost systems, that will show besides the current cash costs for labor and material, the necessary cost of idleness, the cost of plant replacement measured in our depreciated dollars, and the cost of development work. Let us pay adequate compensation for competent labor, management, and engineering. Let us make sales policies constantly conform to the principles of conduct so well outlined by this association.

I would have every member of this association understand the necessity of a broad outlook on these subjects, and I would have all of you work to those ends. For with such vision and action, you will be better able to serve yourselves, to serve the machine tool industry and serve the industries that depend on us for the development and production of better and better master tools.

Three Labor-Saving Tools from the Northern Pacific Shops

By Frank W. Curtis
Western Editor, *American Machinist*

Gage for laying out tender trucks—Combination head for turning and threading grease-cup plugs in a radial drill—Gear driven attachment to an air motor for reaming cylinder-flange holes

MISALIGNMENT of tender trucks is a serious evil that causes a great deal of waste in railroad operation. Stresses, set up by misaligned axles, will cause excessive wear on journals, pedestals, journal boxes, wheel flanges and rails. A common method used in laying out the location of pedestals is to scribe a line on both side frames from the centerplates of the truck as shown in Fig. 1 at *A*. From this line the distances *B* and *C* are laid off on each side frame. This method, however, is liable to result in error. If the line *A* is not normal to the side frames, the wheels will not track, even if the pedestals are equally spaced from the line. In Fig. 2 is a diagram indicating how the wheels would be thrown out of alignment with the track by such an error.

To overcome the possibility of such misalignment, the St. Paul shop of the Northern Pacific Railway Co. has developed a gage that determines a direct relation between the centerplate and the pedestals. In Fig. 3 is illustrated the principle involved, in which the distance *A* determines the locations for all the pedestals. The gage is shown in Fig. 4 on an equalized, pedestal-type tender truck, and in Fig. 5 is shown the adjustable swivel-plate of the gage in place and in contact with the frame. A line is scribed from which the location of the inner pedestal jaw is determined. The locations of all the other inner pedestal jaws are found in the same manner. Layout marks for the opposite or outer pedestal jaws are made similarly. Constructional details of the gage are shown in Fig. 6. The gage not only gives the correct location for the pedestal jaws, but it also renders a rapid means of layout.

In using this gage it is presupposed that the center plate occupies a position midway between the side frames, also that the side frames are straight and parallel with each other. If these conditions do not obtain, no tram will give the proper location of the pedestal jaws.

Grease-cup plugs are turned and threaded in a radial drill as illustrated in Fig. 7. The work is passed through the combination head shown attached to the machine table. A driving shank, squared on its lower end and mounted in the machine spindle, is used to drive the work from the open end. In Fig. 8 is shown a diagrammatic layout of the head. The work is shown at *A*, while at *B* is shown the gage used to set the turning cutters concentrically. The work is revolved at 150 r.p.m. for the turning and at 70 r.p.m. for the threading. A plug is machined in 1¼ min. The oil used as a cutting lubricant, drops in a pail covered with a wire screen so as to catch the finished work.

The holes for bolting the cylinders together are reamed by the air-operated tool shown in Fig. 9. The tool is a close-quarter air motor, equipped with a gear-driven head. The head has a train of three gears, the driving gear running in hardened steel bushings, and the intermediate and driven gears run in bronze bushings. Ordinarily, the operation is a hand job, due to

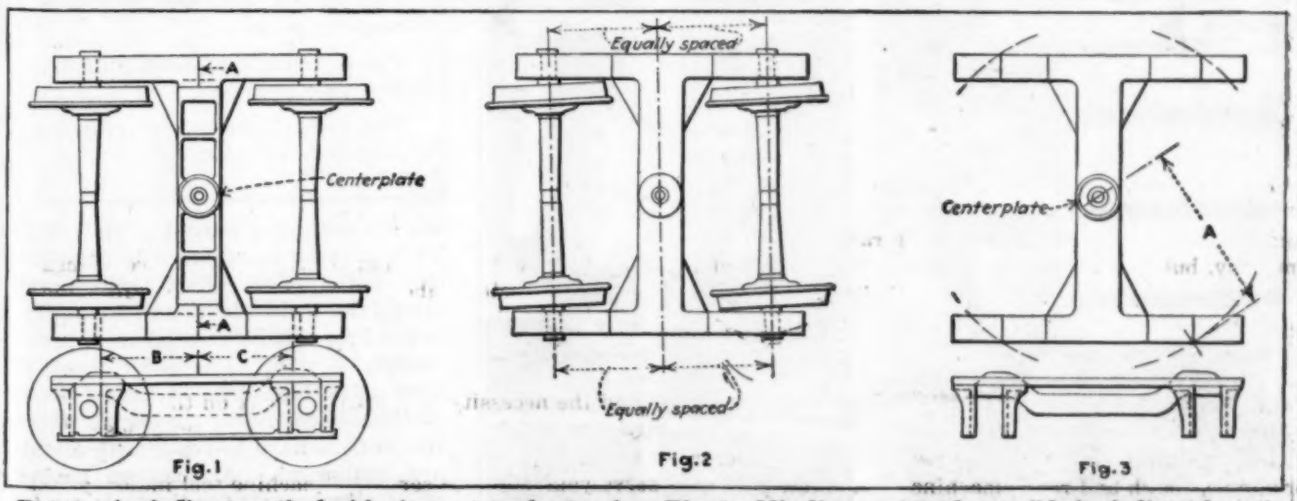
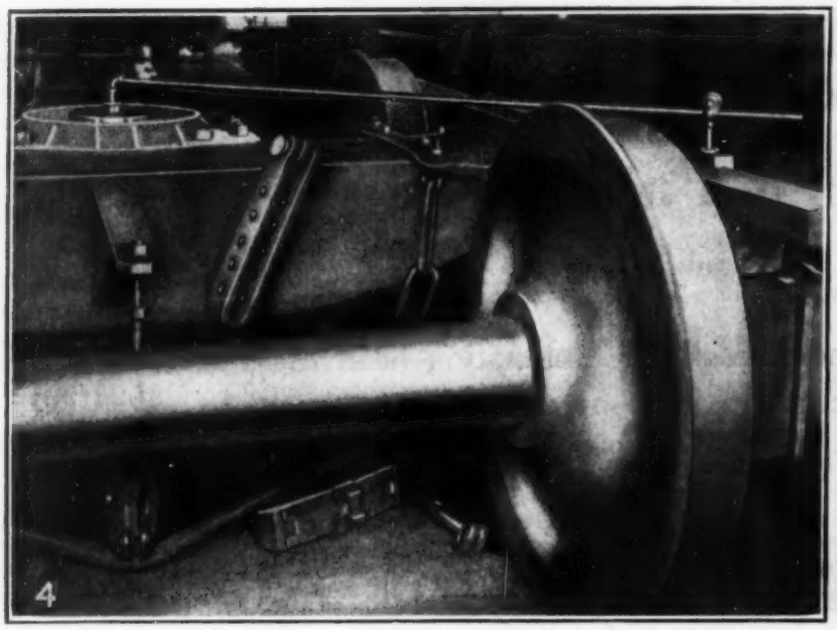
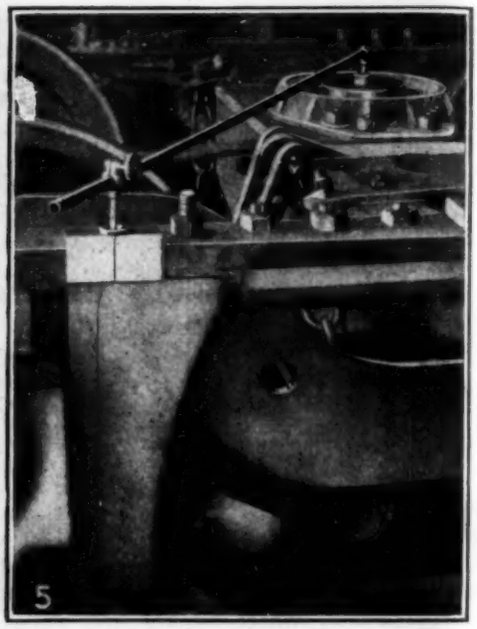


Fig. 1—An indirect method of laying out tender trucks. Fig. 2—Misalignment made possible by indirect layout Fig. 3—Layout having direct relation between centerplate and pedestals





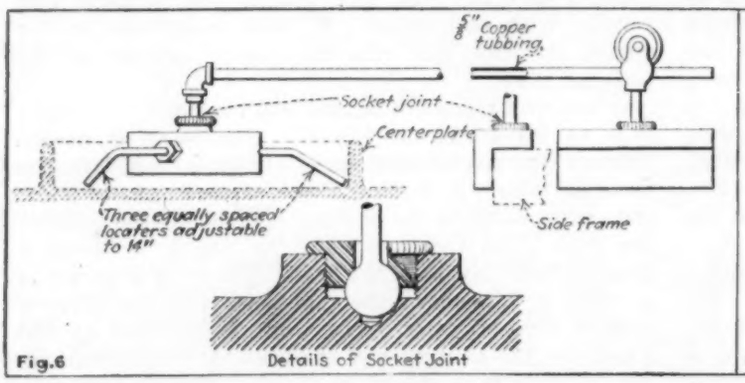


Fig.6 Details of Socket Joint

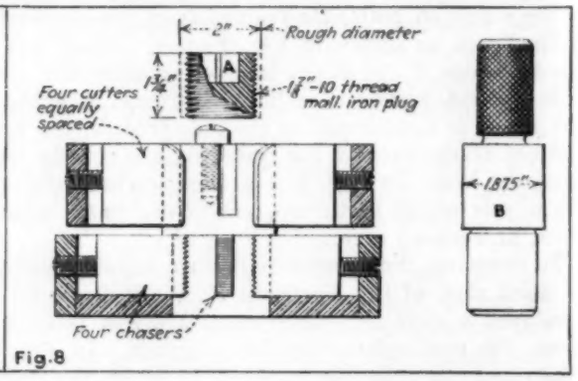
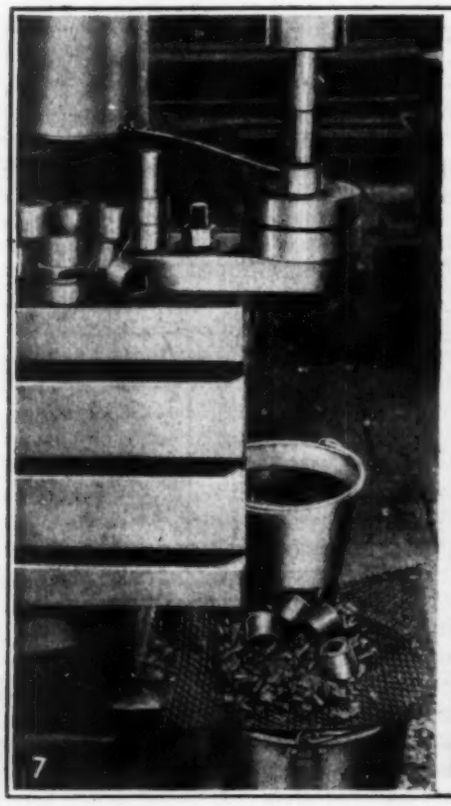


Fig.8



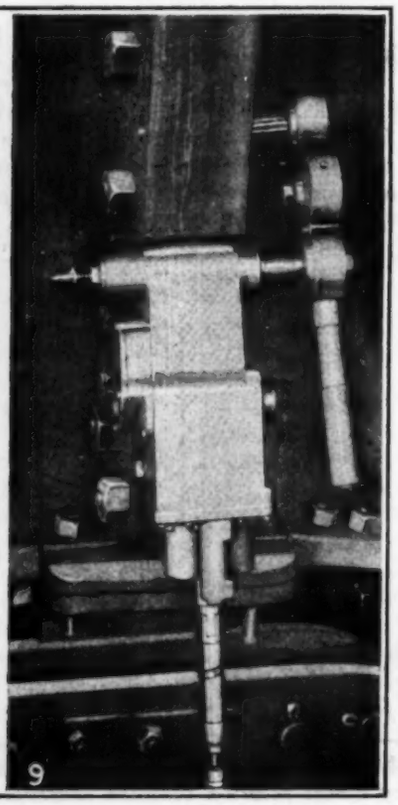


Fig. 4—Gage used to lay out location of pedestal jaws

Fig. 5—Side view of truck with gage in place

Fig. 6—Constructional details of gage

Fig. 7—Turning and threading grease-cup plugs

Fig. 8—Details of head, plug and tool-setting gage

Fig. 9—Attachment for reaming close-quartered holes

the limited space available, and 15 to 20 min. often is required to complete one hole. The offset attachment allows the tool to be driven by power, and a hole can be reamed in approximately 4 min. The attachment is used advantageously in frame work and operations under the engine where the work is hard to reach with standard equipment. Air motors having offset attachments for the tools can be used to advantage in many places.

Water-Japan and Water-Japan Installations

By Dr. Wheeler P. Davey* and E. W. McMullen†

Methods and equipment necessary for the application of water japan—Electric and hot-dip methods—Construction and operation of the apparatus

WATER-JAPAN differs in composition from the ordinary type of high-grade baking japan in that distilled water is used as a "solvent" instead of kerosene or other inflammable substance. This substitution of water for kerosene changes the properties of the liquid japan to such an extent that the standard japanning methods cannot be easily used, although the substitution does not change the essential properties of the finished job after the japan has been baked. New methods and, in some cases, new apparatus have been necessary. For instance, the specific gravity of water-japan is almost identical with that of water. A hydrometer, therefore, cannot be used to determine the concentration of japan base in the water. It is necessary to curdle the water-japan so as to separate the japan base from the water, thus giving the concentration directly in per cent. A concentration of 20 per cent seems to be the most satisfactory.

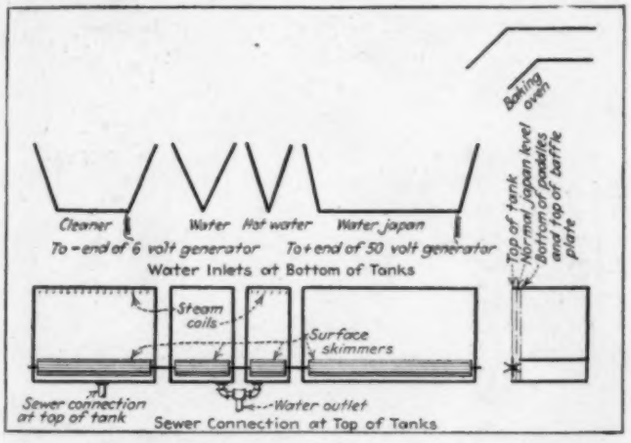


Fig. 1—The electrical-dip method for water-japanning

Water-japan has a viscosity nearly as low as water, so that it will run off the metal much as water does. New methods of dipping, therefore, have been developed. The first of these depends upon the fact that each tiny particle of japan base in the water carries a "negative" electric charge. This makes it possible to electroplate the japan base onto the metal in a substantially water-free condition. The second method consists in heating the metal to 500 deg. F. and plunging it into the water-japan. After the metal is once coated it is baked in the usual way.

The electrical-dip method is especially adapted to that large class of work which requires only one coat. It comprises four steps: (1) cleaning, (2) rinsing and drying, (3) electrical deposition of the japan base, and (4) baking. These four steps, as shown in Fig 1, may all be carried out on a conveyor chain. The cleaning tank is insulated from the ground and is connected to the negative terminal of a six-volt generator such as is used in electroplating work. The current required is 30 amp. per sq.ft. The time of cleaning for dirty metal is six minutes. This gives a maximum power load of 0.018 kw.-hr. per sq.ft. Oakite, Wyandotte, or similar compounds are used in the cleaning solution, in the proportion of six ounces to a gallon of water.

The skimmer system shown in Fig. 1 is essential for keeping the surface of the cleaner free from grease and scum. In Fig. 2 is shown a laboratory installation of water-japan equipment showing the skimmer on the right-hand tank. The skimmers are built with eight paddles which dip about 4 in. into the cleaning solution. The peripheral speed is about 500 in. per min. Similar skimmers are used on both the rinse tanks and on the

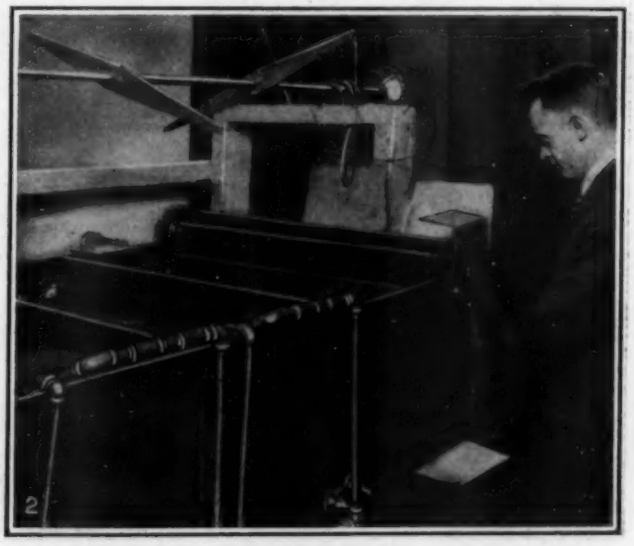


Fig. 2—A laboratory apparatus for japanning

*Research Laboratory, General Electric Co.
†Technical director, Simmons Co.

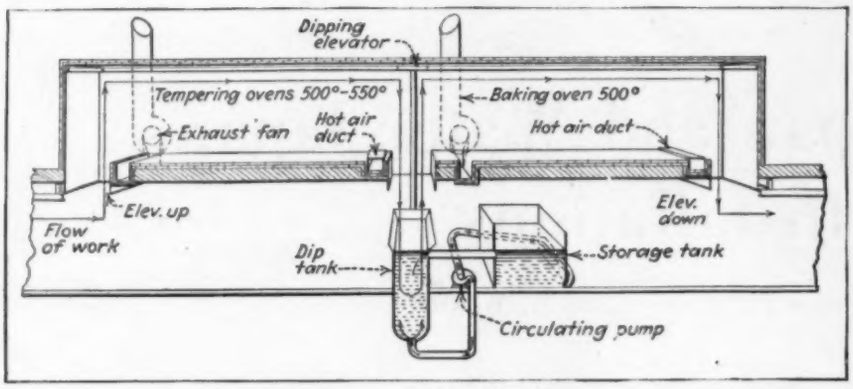


Fig. 3—The hot-dip apparatus

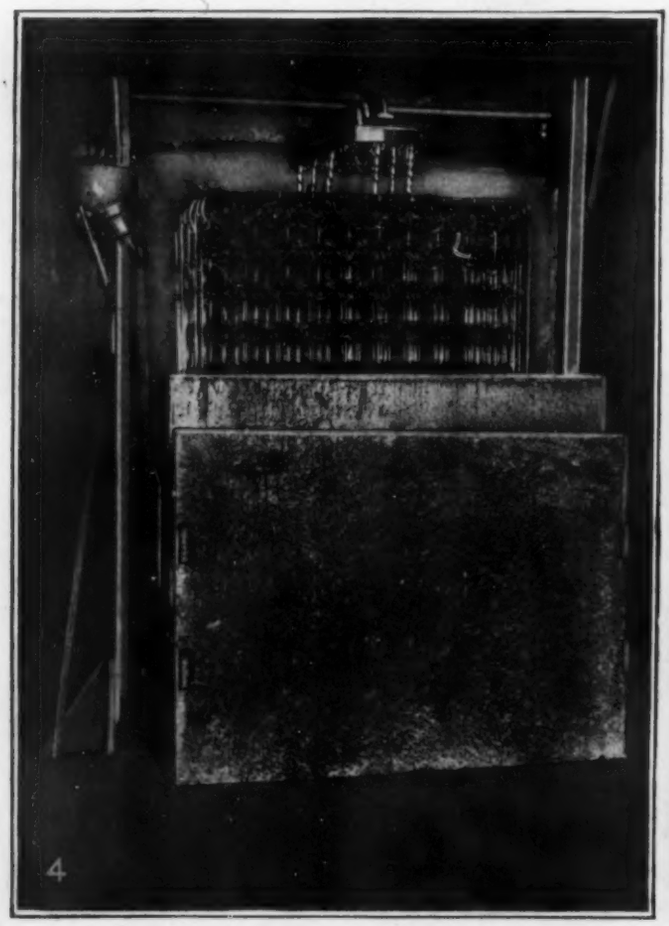
water-japan tank. The skimmer on the japan tank also acts as a circulating pump, so that water cooling coils can be inserted, if necessary, below the level of the japan, between the tank wall and the baffle. The skimmer on the japan tank should be kept in operation day and night, including Sundays and holidays, in order to keep the japan from scumming on the surface.

The japan tank is connected to a direct-current generator—furnishing about 50 volts. This should be an intermittent connection. The connection is opened at the moment that a piece of metal starts to enter the japan and is not closed until the metal is completely immersed. The time of plating will ordinarily be from 1½ to 3 min. The baking schedule is:

15 min. from room temperature to 200 deg. F.
15 min. from 200 deg. F. to 275 deg. F.
15 min. from 275 deg. F. to 450-500 deg. F.
10 min. at 450-500 deg. F.
15 min. from 450 deg. F. to room temperature.

The hot-dip method comprises three steps: (1) preheating, (2) dipping, and (3) baking. The preheating not only gives the metal a supply of energy with which to separate the japan base from the water, but it also serves to clean the last traces of grease and oil from the metal surface. In this way an exceptionally clean surface is provided to which the water-japan can adhere. This is especially important in the case of metals like brass, copper, or aluminum.

In the hot-dip method, the essential thing is to plunge the hot metal suddenly into the water-japan. This process requires a special apparatus. Equipment for hot-dipping has been installed by the Simmons Co., Kenosha, Wis. The apparatus was especially designed for applying water-japan on coil springs for beds, though it is applicable and is used for other forms of steel such as small helical springs and even beds. The only change required is in the form of the carrier. The general outline of the oven is indicated in Fig. 3. It is of the overhead-tunnel type into which the work is hoisted by a vertical elevator, pushed along the oven mechanically, dipped into the water-japan when at the



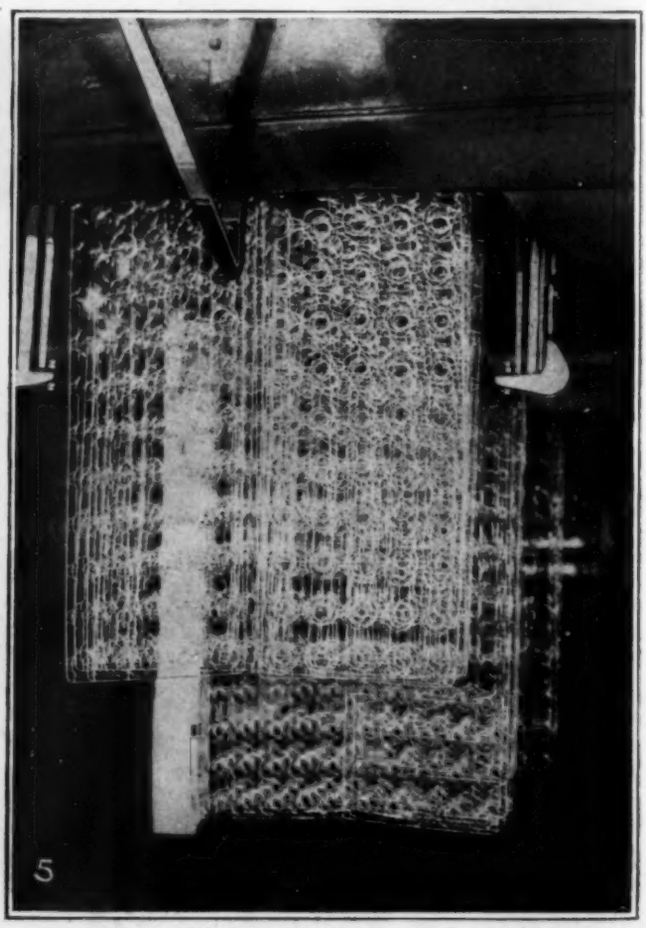


Fig. 4—The dip tank of the Simmons Co. equipment. Fig. 5—Loading the springs on elevator to the preheating oven

proper temperature, hoisted back into the oven, pushed on through a baking oven and finally dropped down at the end by means of a third elevator.

In Fig. 4 is shown the dip tank and in Fig. 5 is shown the partially-loaded elevator for raising the springs into the oven. The construction of the outside of the oven is sheet metal, 24-gage, reinforced by angle irons. The walls consist of two sections of sheet iron, between which are two layers of 85 per cent magnesia brick. The two layers are 4 in. thick. The joints are staggered to make the insulation as complete as possible. Angle irons, 1½x1½x⅛ in., are used to reinforce the sheet steel sides every two or three feet and are riveted firmly to the sheets. The outside sheets inclosing the brick layers are drawn together by bolts. The roof of the oven is constructed in a similar manner, with the reinforcing angles every two feet and using a 1½x2x⅜-in. angle.

Hydraulic Elevator System

Longitudinally through the center of the oven just below the roof, there runs an I-beam to hold the carriers for the work. At the two ends and the center there are gaps for the three vertical elevators. These elevators carry the missing pieces of the I-beam, which, when the elevators are up, fit into the I-beam track exactly and allow the carriers to be pushed along as required.

The elevators and other mechanisms are operated by high-pressure oil cylinders. The pumping system keeps the oil at about 1,000 lb. per sq.in. pressure and distributes it to the points desired by means of pipe lines. One pump and system is required for the elevators and all other operations including the pushing of the carriers through the oven. Positive stops at both top and bottom prevent the carriers from catching as they are rolled on and off the elevators.

The heat for the oven is supplied by special oil burners operating in a combustion chamber outside the oven. The oil is atomized by compressed air into a rather large brick combustion chamber, constructed to give free passage to the gases and yet maintain high enough temperature to insure good combustion. These burners and chambers are outside the oven and are not shown in the drawing in Fig. 3. The preheating half of the oven is heated by the direct products of combustion blown in by a No. 3 "Sirocco" fan handling about 3,000 cu.ft. per min. The incoming duct is shown in Fig. 3. It is constructed so as to distribute the air uniformly across the oven. The temperature of the incoming air is from 800 to 900 deg. F. depending on the weight of the load to be heated, and is thermostatically regulated to maintain the average temperature above 500 deg. F. The exhaust gases are removed by means of a second fan as shown and blown out through a stack. The six burners required for this unit each use about 2 gal. per hr., or a total of 12 gal. per hr., for the preheating end.

The baking end is heated by means of a similar set of burners, though only four are required in this case on account of the residual heat in the work after leaving the water japan. The direct products of combustion are not used in this case, but fresh air, passing through ducts around which the combustion gases pass, is heated to the required temperature of about 650 deg. F., and is blown into the oven at a speed of 3,000 cu.ft. per min. The air maintains the oven temperature at about 500 deg. F., and it is removed by means of an exhaust fan. The thermostats for the control of the oil burners have their pyrometers located nearer the exhaust than the incoming air.

The dip tank, shown in Fig. 4, is a large iron tank with a capacity of 1,200 gal., 3 x 6 ft. in surface area. It is kept full of water-japan at all times by means of a centrifugal pump as shown in Fig. 3. A pump of the surface skimmer type can be used if desired. As the japan is used, the fresh supply is added to the storage tank which has 600-gal. capacity. In this storage tank are many feet of pipe through which cold water is circulated. It is not difficult to keep the temperature of the japan below 90 deg. F., and little trouble is experienced from scum forming on the top of the tank. There is a large overflow pipe from the japan dip tank to the storage tank so that a constant level can always be maintained in the dip tank and a very rapid flow due to the centrifugal pump between the tanks. All metal in the tanks, pipes and pump is iron in order to prevent any deposition of the solids on the japan.

Distilled water must be added quite frequently to maintain the desired condition. The evaporation of the water is greater than the amount of the japan base deposited on the work even though the storage tank is kept covered and the dip tank is covered at night. The allowable limits for the solids are quite wide and any reasonable control, such as once or twice a week, is sufficient to keep the japan in a good operating condition.

The time required in the oven is about 40 min. 20 min. for preheating and 20 min. for baking. There are 19 carriers in the oven for the equipment illustrated. Each carrier holds coil spring assemblies for the spring mattresses. Each mattress weighs from 30 to 70 pounds. The operations consist of pushing the first carrier on the elevator; lifting it into the oven, while dipping a carrier load in the japan and lifting it into the oven; almost simultaneously lowering a carrier at the finishing end of the oven; then a forward movement of the entire lone, one carrier length, imparted by the mechanical pusher. These operations are all accomplished in about 2 min. so that the output of mattressess is about 90 per hr. The dipping movement in and out of the japan is rapid so that the coated springs are still quite warm as they go back into the oven. This results in a saving of fuel and makes it easier to keep the japan cool.

Give the New Man a Chance

By Frank V. Faulhaber

The old employee too often is resentful of the new foreman, particularly if the latter is a "rank newcomer," and he may have nothing to do with him except what is absolutely necessary. One hardy old timer, however, had something interesting to say on this point.

"You never can tell what a new man may have up his sleeve," observed this old-timer, "so I always look favorably on a new foreman, even though he is young in experience and comes from the outside. Many times he will bring new and valuable ideas with him. There should be less coldness between old machinists and young executives, for the good of both parties. No possible benefit can come of the shunning of one another."

THE · FOREMAN'S · ROUND · TABLE

Who Should Keep Machines Oiled?

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"HAD another breakdown this morning, Al," said Ed, as they walked to the station last Monday night. "Bill forgot to oil his machine this morning and the main bearing froze tight before noon. I don't see how any man can forget to oil up, but some do and it's usually Monday. Thinking about the week-end party, I suppose. Do you have much bearing trouble, Al?"

"Not so much as I used to, Ed. Oiling is one of the side jobs that isn't counted in the bonus or piece rate—and some men seem to just plumb forget it—'specially on Monday morning, as you say. So I'm trying out a new scheme. I took Jim Daly, one of my brightest apprentice boys, and made him responsible for oiling the machines in our department. I told him how important the job was, spent some time showing him where to look for oil holes and reservoirs and gave him a little bonus for every week we run without a shut down due to bearing trouble.

"Jim appreciates the responsibility and he's doing a good job at it. He takes part of his noon hour sometimes to make sure that oil holes are clear. He's also learning something about machines in general, and he's earned his bonus every week so far. Not a bearing shut down since we started.

"What we really ought to have, Ed, is a man whose main job is to keep machines oiled. Jim can do the work in about a half hour a day. But a real oiler—or even an oiler-gang—is better, to my way of thinking."

"Don't agree with you, Al. Takes away individual responsibility from the men. Every man ought to be responsible for his own machine. Then he hasn't any alibi."

"Bill may not have had a good alibi, Ed, but he did have a breakdown and you had a hitch in production. That 'personal responsibility' business sounds fine but I'm not so sure about it in actual practice. What we want is continuous production and anything that helps us get it beats theory a mile. I'm still for having Jim oil the machines in our department."

Is Ed right in having every man take care of oiling his own machine? Or is Al's plan better?

Is Al's idea of using an apprentice a good one where no regular man is available?

What is the objection, if any, to Al's plan?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen. of course

Discussion of Earlier Topics

Letting a Man Try His Own Way

A FOREMAN'S aim should be at all times to serve the best interests of his employer rather than to arbitrarily force his own ideas upon his men.

The foreman who possesses the ability to analyze the ideas of his men, to separate the wheat from the chaff, and to do it in such a manner as not to antagonize the employee who conceives the idea, is the man who will be serving best the interests of his employer, the employees and himself.

It is hardly to be expected that any one man will have the best ideas regarding everything that comes to his notice. Some of the men under a foreman may have had direct connection with certain phases of the work that will allow them to advise him as to the method of procedure used in other places.

That either discipline or ideas should be sacrificed, is entirely unnecessary. A foreman must at all times keep the men in his charge under control. If the method of the employee and that of the foreman seem to be of equal merit, it is usually well to allow the man to do the work according to his own way, since he will take more pride in his work and the morale of the organization will be better. But it is somewhat of an individual matter, depending on the character of the employee. In fact, the whole question of letting a man try his own way resolves itself into the fitness of the foreman for his position, in knowing when and when not to assert his authority.—FRED G. WILSON.

THE · NEXT · TOPIC

Personal Appearance in the Shop

QUESTIONS

Of what effect is the matter of dress in the shop on the work done by the men?

Is it advisable for the foreman to dress better than his men?

Is the superintendent justified in speaking of a personal matter like dress to his foremen? Are the foremen justified in speaking to the men?

Letting a Man Try His Own Way

TO MY way of thinking, Ed was depriving Jimmie of the opportunity to use his own brains and to develop new methods of production. Al had the better idea in encouraging Jimmie to develop himself mentally. But if every one in the department thinks his idea of doing a job is better than the one usually used and does his jobs according to his own notions as to the best way of doing them, without consulting the foreman, the entire department soon would be in a turmoil and turning out spoiled work.

I believe that it is best to send out an operation sheet with each job, describing the list of operations and their sequence. Al should give Jimmie one of these operation sheets with his job and then encourage him to think of any better method and adopt it if worth while.

If Jimmie's method is superior, then the next time the job comes around his method should be on the operation sheet so that some other man who may be doing the job the next time can follow out the new method. This system will maintain discipline and at the same time allow for the development of new ideas.—JOS. E. ABBAZIA, *Mech. Instructor.*

Letting a Man Try His Own Way

WHERE is the man so hammer-headed as to want every job done his own way? Surely not working as a foreman. If he does demand his own way, the men will certainly lose their respect for him. Why, he can't look after more than two men with that method of management. That foreman doesn't want brains in his employ. He is the kind of man that ought to be running a bunch of automatic screw machines for himself.

On the other hand a foreman would have a "whipped-cream" disposition if he allowed his men to propose a different plan than his every time. God gave us ears to hear with and if we listen we will hear. It's easy enough to take off the head set if we don't like the program. You have the advantage, Mr. Foreman, but don't be rash.

A foreman should know even more than just how to instruct his men in the ways of mastering their problems. He must know his men. He should know a good thing when he hears it. He should shake a man into attentiveness and at the same time not gather cobwebs himself.

Discipline in the machine shop and discipline in the regular army are vastly different. The old time foreman requiring a hat-tip has passed. If a foreman insists on every job being done his way and is as severe in other ways, he will develop a lot of hat tippers, hat tippers who are not showing courtesy, but reminding him that they have heads under their hats.—STORRS T. RICHMOND, *Master Mechanic.*

Letting a Man Try His Own Way

WHY should either discipline or ideas be sacrificed in gaging the relative importance of new ideas from the brains of the employee or rigidity of discipline at the sacrifice of ideas? A foreman's job is creative, not cut and dried, and it should be artistic. What the foreman has to create is the atmosphere in a shop in which the best results are obtainable. He needn't paint his pictures all red.

Ed seems to forget that it is the firm who pays Jimmie Johnson and that Jimmie does not work for Ed but with him. Why should Ed worry as to whether or

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not his or Jimmie's method is being used on a job. If Jimmie is sensible enough to devise a new method for doing a job, he is surely sensible enough to know that Ed has other qualifications which he himself has not. Ed's experience tells him whether or not Jimmie's ideas are worth anything or not. If they are, he has no right to prevent the firm from getting the benefit of them because of his exaggerated sense of dignity.

If Ed is dealing with a messer he will have to be arbitrary and say that this is the way the job must be done. If he is dealing with Jimmie, he can tell him that this is the way the job was done last time. We want it as soon as possible so do it the quickest way possible. If you want anything, let me know. That shouldn't hurt Ed's dignity.

No two men are alike and the discipline horse can be ridden too hard. Some men have lots of ideas and no executive capacity. Others may have lots of executive ability but are not so productive of ideas. If the foreman is worth his salt, he welds the entire group into an efficient organization. It may be possible for the foreman to do the firm good, by effacing himself, occasionally, from the department and taking a rest in the office, not giving too many orders.

If good discipline is maintained, the men will not run around with frivolous half-baked ideas. The latter will somewhat automatically become sifted out. It is quite possible for discipline and ideas to run together.—R. IBBOTSON, *England.*

How Should Suggestions Be Handled?

DURING nearly fifty years of experience as a shop foreman, the dictum, "I want to do what's right, even if some better guy gets my job," cited in the discussion between Al and Ed, has been my guide and I fully indorse and agree with it. During these years, hundreds of men, as well as boys, have worked with me, many of them now in better positions than mine.

We foremen—some of us—have the mechanical microbe in our blood and whether for pecuniary reward or not, cost-saving ideas, new and improved devices, and methods are constantly developed by us and are freely given away. It does not matter to us whether Williams or Scotty gets the credit, the essence of durable satisfaction to us is that, like Jack London, "Alone we have done it."

Observers call us simple and foolish, in this case, and, perhaps, in a way, we are. But those whose obsession is money should remember that there are still men and women in this old earth who value their self-respect infinitely more than riches or advancement. Naturally, during my years of foremanship, cases of piracy of ideas have happened, not only on the part of foremen, but on the part of higher officials.

Just one case to illustrate: some years ago, while foreman of fitters and machines in a large works at Radford, Nottinghamshire, I invented a new and inexpensive split pulley and offered it free of charge to the works manager. He turned it down with some asperity. Confident of its value, I took it to the general manager who highly approved of the idea and gave orders for mass production of the pulleys. From this point on, the works manager made my life unbearable until it culminated in an "up-and-downer" in the shop. He was an old employee and I a new one, so I got the sack and a month's notice that I refused to accept. He finally gave me a month's salary and I had a month's holiday. —J. T. TOWLSON, *England.*

Where Shall We Start Apprentices?

THE traditional way of training apprentices in the shop may have been all right in the earlier days, but times have changed. Machines and methods have been completely revolutionized and have, in turn, revolutionized the trade. In addition to this, the boy of today is far in advance of the old-time apprentice, both in physical capacity and school training.

Because of the simplification of machine-shop equipment in general and the facilities accorded to him at technical school or at college, he can master the trade in much shorter time than used to be the case. In by far the majority of cases the old-time apprentice looked upon the machinist job as the height of his ambition. Now the machinist's job is merely a stepping stone to an executive position.

Most of the really dirty jobs that I had to do in my time have disappeared. Lubricants are now supplied from outside the shop, contractors white-wash the walls and clean the windows, and methods of lubrication and cooling have advanced so that there is not the filth that there used to be attached to it. Wherever there is dirty work to do, of course, the apprentice should take his share of it. It must be understood, however, that the parents of the boy are allowing him to accept less wages so that he will be thoroughly taught the machinist's trade.

The graduation of the boy from one machine to another all depends on the individual ability of the boy. It is difficult to lay down hard and fast rules where there are so many machines and operations with which the apprentice should be familiar. If four years is to be the period of apprenticeship, the following would be, I think, a good schedule: Bench, 6 months; drilling machines, 3 months; planer and shaper, 3 months; lathes, 9 months; grinding machines, 3 months; milling and gear-cutting machines, 6 months; toolroom, jigs and fixtures, 12 months, bench work, 6 months. Monthly records should be kept to show the progress of the apprentice. Working tests should be given after each year of work.

I have noticed, in my own experience, that boys who start on assembling work have many advantages over the ones who start on the machine, in knowing where each piece fits, whether the work is to be accurately

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sized or loosely fitted, and in being able to read blueprints more readily and quickly. He is therefore less trouble to the foreman. It is also more interesting to see a machine built up unit by unit than to see the odds and ends that fall to the boys who start in on the machine work immediately.—ARTHUR SILVESTER.

Letting a Man Try His Own Way

ED IS wrong in trying to make a man do the work the foreman's way. Without realizing it, he is trying to make a lot of "near Eds" just to appease his own vanity. He is stifling personal initiative and getting into a bad rut. Every man has some good ideas, perhaps mixed with a lot of chaff, but ideas which can be used in cutting labor cost. A man who has submitted to such treatment as Ed is giving Jimmie, can be spotted even when he has moved to another shop because he does things just the way he is told to do them without trying to determine if the job can be done in a better way. Also, he will always wait until he is told how to do a job before he begins it even if he has worked on that job before.

The man who has been given freer rein in handling his work is always trying to think of some way whereby he can shorten the time. A workman has a little vanity just as the foreman has and likes to think that he can do a certain job a little better and a little faster than the other men. He is willing to work his head off to make better time on the job if he is trying out his idea and sometimes will work harder than usual just to prove his idea is practical.

Of course, every time that a man suggests a new way to do a certain operation, the foreman cannot let him try it. The foreman is supposed to have more experience than the other men, so when a man comes to him with an idea or suggests a different method of doing a job, he has to be able to either show him where it will fail or that it has been tried before and does not save time. On the other hand, if the suggestion seems to have merits, he may let the man try a few pieces, if they are not very important. A man will be very careful about making suggestions if he is allowed to try them out and he cannot make them work. If he is just told that they will not work, he is suspicious that he is just turned down. If the job is given to another man and the other man fails, he is sure that the other man "threw the job" for spite. Of course, if special tools or machines are required, things are beyond the control of the foreman and the suggestion has to go to the higher officials for their approval.

To insist that certain methods be used just because that is the way that the operation was done at the start is all wrong as very often other ways turn up later that will make a very great difference in the time required for the production of a piece.

Discipline does not have to be sacrificed for new ideas, since the two are not tied up together. A foreman, such as Ed appears to be, may have a shop where the men are swapping stories and loafing during working hours. On the other hand, in a shop where the foreman allows the men to use their own judgment, the discipline may be very strict. The men attending strictly to business and getting all the work out of a machine that it is possible to get, are the ones that it is well to cater to somewhat, the ones that should be allowed a little leeway and who can be depended on to repay with interest the confidence placed in them.—CHARLES O. RANKIN.

How Should Suggestions Be Handled?

THERE is an old saying, "Credit to whom credit is due." Ideally considered, this is the best possible arrangement. On practical, as well as psychological grounds, many complications arise. Tact—that splendid lubricant but elusive quality—is the supreme essential where management of men and affairs is concerned. A foreman has to be fair all around. He has to do the fair and square thing for his men and for himself, as well as for his employers. There is, therefore, a "trinity" of interests.

In sending Scotty to Williams, with his suggestion, Al did the fair thing toward Scotty, but hardly for himself. Certainly Scotty should be present when his suggestion is presented to Williams, the superintendent, but Al should be there too. Instead of sending Scotty to Williams, Al should have taken him to Williams. Al, as foreman, is the man to appraise Scotty's idea. He evidently decided that it was a good one and showed by his fairness that he was a good man to assist in the necessary discussion of ways and means and to generally advise in regard to the practical application of the idea.

The essential details in handling suggestions seem to be these:

(a) That worthy proposals from men of the shop should be assured of careful and impartial consideration, *but* through recognized channels.

(b) That discipline and order must be maintained.

(c) That means to this end must be devised so as to obviate friction and ill feeling between any of the parties.

Foremen should be given to realize that the success of their respective departments is rightly regarded as their success also. The shop team should work through the team master.

The foreman should introduce suitable proposals to the superintendent in the presence of the proposer. The proposer will make out a better case for himself, in many instances, through the sympathetic backing from a sympathetic and discriminating foreman.

Williams will probably insist upon the presence of Al with Scotty. While Scotty ought to be there, Al must be there, and Al will probably get taken to task, when Scotty has gone, for not coming with him. —W. ROLAND NEEDHAM, *England.*

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

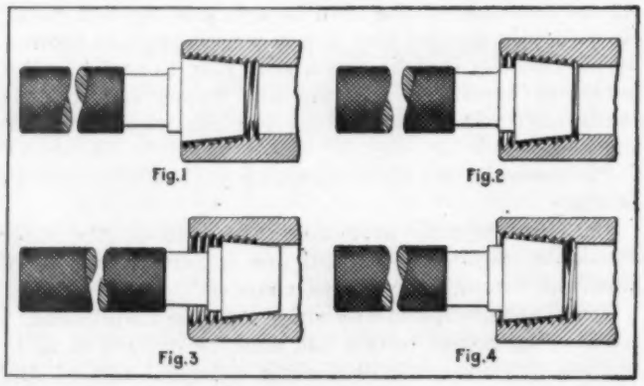
Gages for Rapid Inspection of Taper Threaded Parts

BY H. V. WHITINGER

In the manufacture of steel parts having a Briggs standard taper thread, we were troubled with high inspection cost. It was necessary to give each and every piece some sort of check on the threads in order to detect imperfections due to three principal causes; worn or otherwise imperfect taps, machine trouble, and the human element.

We were using a standard, taper thread gage to check the work while setting the tapping machines to proper depth, and also at intervals on the parts produced, but as one man operates more than one machine and the rate of production is high it is possible for the machine to be set wrong, for taps to become worn, or, after having been set correctly, for the machine to get out of adjustment. In the meantime some defective parts will be mixed with those that are good.

These parts all go through a final inspection before assembly, but the time required to screw a threaded



Figs. 1 to 4—Plain plug gage for threaded hole

plug into thousands of parts daily would be too great, and the results might be unsatisfactory, since a threaded plug is misleading if the thread to be gaged has been cut with an imperfect tap.

To the eye, a thread may appear good, but since a tap will wear out first on the crest of its thread and cut wide or flat at the root of the thread in the part tapped, an error may be present which in small tapped holes is hard to detect at a glance. A solution of our problem was found in the use of a smooth, taper plug gage, used in conjunction with the standard, taper threaded plug to set the machines and to check the work at intervals. A duplicate smooth gage was furnished to the inspectors at assembly, with which they could check each part quickly.

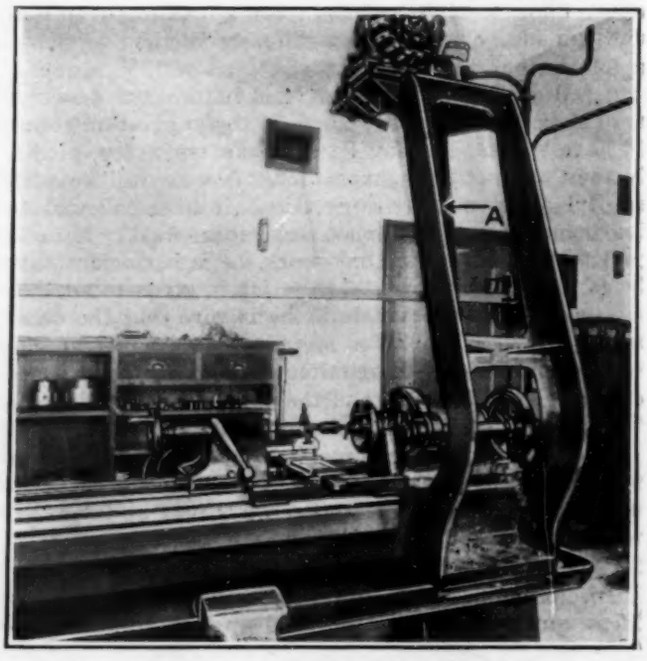
Gages used in this manner have two distinct features: They will disclose an incorrectly adjusted machine or an imperfect tap, without depending on the judgment of the operator as to whether the tap needs regrinding or is worn beyond use and should be discarded, and they will speed up the work of inspection.

The accompanying illustrations show the action of these gages on perfect and imperfect threads. Fig. 1 shows the minimum and Fig. 2 the maximum distance that the plain tapered plug should center a correctly tapped hole. Fig. 3 indicates a hole tapped by a tap that is imperfect by reason of wear upon the crests of the threads. In Fig. 4 the plain gage shows apparently correct, a hole in which the threaded plug will not enter because of imperfect threads.

A Motor Mounting That Is Different

BY CLIFFORD H. FRENCH

In applying motor drives to machines not so equipped, many unusual methods have been developed. The method illustrated herewith, is used in the machine shop of the Wilson Observatory Laboratory, Pasadena, Calif. It was desired to drive the cone-head lathe shown by motor, and at the same time to keep the motor off the floor, or from taking up space around the lathe.



Getting the motor out of the way

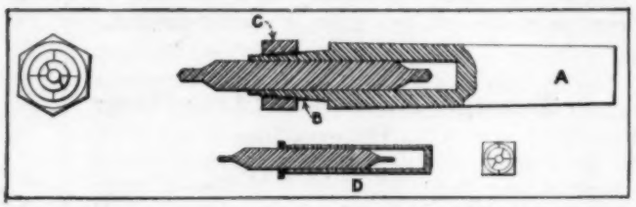
So the substantial casting shown was designed and made. It is attached to the lathe pan, behind the headstock, and holds the motor near the ceiling. A worm-gear reduction between the motor and the upper cone drives the cone at the desired speed. The belt is shown at *A*. The upper cone is carried high enough to give a good length of driving belt.

Chuck for Combination Center Drills

By Geo. R. Miller

The illustration shows a chuck and a collet for holding combination center drills and countersinks. The body *A* is turned to fit the tailstock spindle of the lathe. The end *B* has a ½-in. pipe thread cut on it, to which is fitted the nut *C*. The tool is bored a snug slip fit for the ⅛-in. body of the drill and is then split down to the shoulder with a hacksaw, making two cuts at right angles to each other.

For combination drills of a smaller size, I use the collet *D*. It is made of ½ in. square steel and is bored to fit the drill. The body is turned to fit the hole in the chuck, leaving about ½ in. of the square stock for a shoulder. The shoulder prevents the collet from going into the chuck too far and forms a convenient grip by which to remove it from the chuck. The collet is split



Chuck and collet for combination center drill

from the front to the bottom of the hole and from the back to the shoulder, the saw cuts being at right angles to each other.

With a chuck and collet of this kind in my tool kit, there is no necessity for me to go to the tool crib for a chuck, and perhaps find that they have all been given out. Another point is that the relatively small diameter of the chuck makes it very convenient in center drilling odd-shaped work, where an ordinary chuck would interfere.

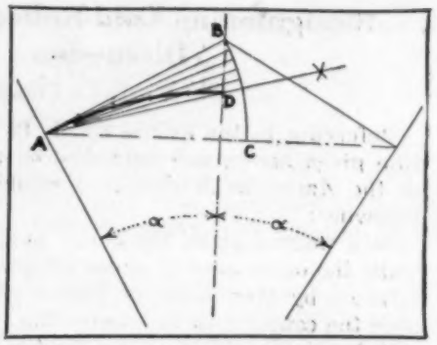
Drawing Arcs of Long Radii Without the Centers

By John S. Carpenter

Frequently I have had to draw parts of very large circles, the centers of which always lay outside of a 9x12-ft. board. Cussing over it didn't help matters any, so I set to work to find a way out of it and still have accurate work.

In an old surveying manual, dated 1859, I found the following, which accomplishes the result so well that it is worth while broadcasting: Referring to the illustration, designate about the length of arc desired by two extreme points and either draw tangents or figure the height of the arc by well known trig methods, as the case seems to require.

Draw a vertical centerline and remember that the arc must pass through the bisected angle *BAC*. Drawing the arc *BC*, step off 8 or 10 parts, as demanded by the accuracy required, on the semiarc, and draw the radial lines as shown. We have the two points *A* and *D* and the arc will pass through them. With a pair of dividers or beam compasses, step off as many parts on the radial lines as were spaced off on the semiarc. If you do this work carefully, you will find that the desired arc will pass through the points so found, and you can draw the curve by means of a flexible ruler held down by pins to the line desired.



Method of drawing an arc without having the center

A little consideration will show that this method is one of laying out a curve by equal deflections, and is no approximation.

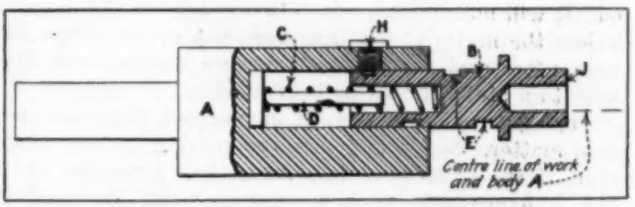
An Automatic Recessing Toolholder—Discussion

By James C. Harper
Port Glasgow, Scotland

The recessing toolholder shown by H. B. Schell, on page 643, Vol. 64, of the *American Machinist*, brings to mind a similar tool used in a shop where I was formerly employed.

The construction of the tool is shown in the illustration. The body *A* has a shank to fit the turret. The part *B* slides in an eccentrically-bored hole in *A*, and is bored to form a pocket for the spring *C*, which is supported by the plunger *D*. A hole at the outer end of part *B* is provided to receive the shank of the cutting tool. The helical groove *E*, in which the screw *H* engages, is cut on the part *B*.

In operation, when end of *B*, at *J*, contacts with the



Another type of recessing tool

face of the work, *B* will telescope into *A* as the turret is moved forward, and will be revolved, due to the helical groove and its engaging screw. If the tool is so positioned as to clear the work when telescoping begins, it will be brought into contact with the wall of the hole when *B* has revolved sufficiently. Continued movement of the turret will feed the tool into the work, thus cutting the recess, the depth of which is controlled by the setting of the tool and the amount of turret movement.

Withdrawal of the turret allows the spring to revolve *B* in the opposite direction, bringing the tool out of the recess and into its original axial position.

Straightening Cold-Rolled Plates—Discussion

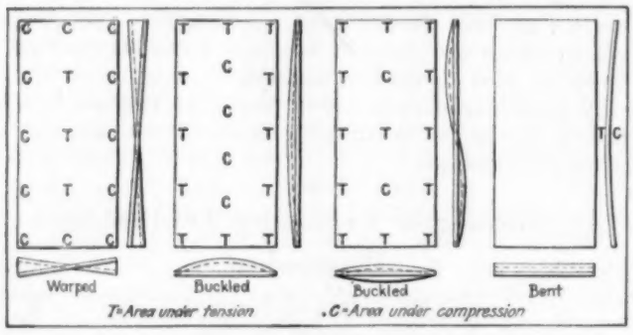
By C. K. Le Fiell

Referring to the article by H. R. Fowler under the title given above, and published on page 870, Vol. 64, of the *American Machinist*, I would like to offer the following:

In a warped plate, the center area is under tension, while the outer area is under compression. Correction is made by stretching, or rather expanding, by thinning the center area by hammering.

A buckled plate is caused by the center area being under compression and the outer area under tension. Correction is made by stretching the outer area.

The hammering is done by either a smooth and slightly convexed hand hammer, or a smooth, slightly



Areas under compression and tension in warped, buckled and bent plates

convexed blacksmith's flatter, struck with a sledge. It is neither necessary nor desirable to use the ball peen of a hammer on sheet metal.

The effect of hammering on sheet metal extends clear through the sheet—the whole area struck being thinned and spread out. When shafts, etc., are peened for straightening, the effect is to stretch the material to a limited depth from the surface struck. The peening is done on the low or short side which lengthens that side, thereby straightening it.

Once any plate has been straightened by these methods, it will not go back again to any appreciable degree, unless the material that has been put under strain has been afterward machined or heated until it can flow back to a state of rest or equilibrium.

Trying to bend a warped or buckled plate will not help matters for it does not remove the cause. However, if the plate is simply bent, then a wooden block and a hammer or a large flatter must be used in straightening, to prevent setting up any unnecessary strains and the attendant warping and buckling. The illustration shows the areas under compression and tension in plates deformed in various ways.

Plates as heavy as ¼x8x18 in. could be straightened to advantage under a light steam or power hammer, if available.

The size or shape of the plates makes but little difference in the way the fault shows up or in the way it is to be corrected. A few minutes' experimentation with a small, thin, square plate, a smooth-faced hammer and an anvil, will suffice to get the knack of it. It should be noted that the hammering is to be eased up as the center is approached, or vice versa, as the case may require. The consequent reduction in thickness is probably around one per cent, depending upon the degree of inaccuracy.

No matter what may be the nature of the deformation, the theory of straightening or flattening is the same for all relatively thin plates.

Turning a Smooth Taper on a Screw Machine

By H. B. Schell

We recently had considerable trouble in getting a good finish on a tapered surface, turned on a B. & S. automatic. The work was too long to admit of forming, so it was produced by a swing tool in connection with an adjustable guide on the front slide. The procedure was to feed the tool forward until the end of the cut was reached, drop the front slide back and withdraw the turret. This method never gave the smooth finish desired, neither did altering the shape of the tool bit.

The cams were finally redesigned as follows: The lobe on the lead cam for this particular cut, was changed to feed the turret forward and back, similar to a thread lobe. The front-slide cam was made to dwell, holding the guide in position until the turret reached the back position and the swing lathe tool had passed off the work. This method gave us a roughing cut on the forward travel of the turret and a finishing cut on the reverse movement, and gave the finish desired.

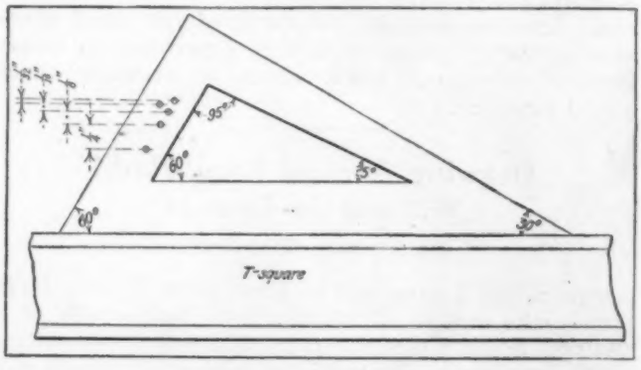
Triangle Altered for Lettering—Discussion

By C. O. Kowol

On page 989, Vol. 64, of the *American Machinist*, Arthur R. Myers shows a triangle cut in steps for spacing guide lines for lettering.

I have in use a triangle, as shown in the illustration, which answers the same purpose as the one described by Mr. Myers, and which has another use.

For drawing the guide lines for lettering, I drilled five ⅛-in. holes at the distances shown. In use, the



A double-duty triangle

triangle is slid along the T-square with the pencil point in the desired hole.

In addition I filed one leg of my triangle to 95 deg. so it could be used to draw the alternate long or short lines for indicating threads. When the triangle is placed against the T-square with the 95-deg. leg pointing upward, the thread lines will be drawn at an angle of 5 deg from the vertical.

Characteristics of Alloy Steels

Nickel and Nickel-Chromium Steels

Nickel steel has been known for 40 years, but previous to the development of the automobile it was used chiefly for armor plate and ordnance. Much knowledge of it was gained during the war and at the present time it is estimated that more than 3,500 tons of nickel are used annually in the nickel steels that go into the making of automobiles alone. The parts usually made of nickel steel are gears, steering knuckles, connecting rods, crank shafts, axles, and stressed bolts.

Besides its use in the automotive industry nickel steel is now employed widely for stressed parts in machine tools, for excavating machinery, cast crusher jaws, locomotive forgings, chain drives, and in bridge construction. With nickel steel in bridges it is possible to save from 10 to 30 per cent in weight of the members due to the increased tensile strength. Nickel-steel castings give a tensile strength of from 85,000 to 100,000 lb. per sq.in. compared with 55,000 to 65,000 lb. per sq.in. for carbon steel.

Nickel belongs to the same group of metals as iron and cobalt. Its melting point is 2,631 deg. F. It is malleable, ductile, and possesses a high tensile strength. It can be hot-worked and forged. The nickel and cobalt industry was begun in England in 1830, and all of the nickel previous to 1872 contained considerable quantities of cobalt. Nickel can now be entirely separated from the cobalt, and separate uses have developed for the latter metal. Nickel is used for coins, for nickel plating, and in bronzes, but 65 per cent of the nickel produced is employed in the making of nickel steels.

Effect of Nickel

Nickel lowers the critical temperature ranges of steel. It also increases the hardness and strength of steel without a corresponding loss of ductility. Nickel produces a finer grain structure in steel. It diminishes the rate of grain growth, and thus minimizes the danger of overheating during heat treatment. The beneficial effects of nickel are intensified by the presence of other alloying elements, especially chromium, and nickel-chromium steels are now widely used.

Steels having 3½ per cent of nickel constitutes the bulk of the commerical production of nickel steels. In the low carbon contents, ranging from 0.10 to 0.25 per cent, it is used for case-hardened parts such as gears, worms, pivot pins, and valve tappets. With ranges from 0.25 to 0.40 per cent of carbon it is employed for forgings and stressed parts such as shafts and connecting rods. It is also made into seamless tubing and used for such articles as propeller shaft tubes. The 3½-per cent nickel steel with from 0.30 to 0.40 per cent of carbon is employed in bridge construction for shapes, plates, eyebars and rivets. This steel, with from 0.40 to 0.55 per cent of carbon, is a standard material for heat-treated transmission gears.

Five per cent nickel steel with about 0.12 per cent of carbon is used for case-hardened parts to withstand severe service, such as rear axle pinions. A low nickel steel with only 0.50 per cent of nickel is also beginning to be used for case-hardened parts as a substitute for ordinary carbon steel. It is claimed that this steel gives a tough core, and the case hardens well with an oil quench. There are no commercial steels with a nickel content between 6 and 20 per cent.

High nickel steels with more than 25 per cent of nickel do not yield readily to heat treatment, but they are naturally tough and strong. They are very resistant to corrosion in the air or in sea water. With from 0.30 to 0.50 per cent of carbon they are used for making gas-engine valves and boiler tubes. These steels have a tensile strength up to 115,000 lb. per sq.in. A steel containing 25 per cent of nickel is much used for resistance wire in electric heaters.

Nickel-Chromium Steels

Both nickel and chromium make a steel more resistant to corrosion, and also give the properties to the so-called heat resisting alloys. The special steels containing high percentages of nickel and chromium, and the nickel-iron alloys, however, are not usually classified with the nickel and nickel-chromium steels for general utility purposes.

Nickel and chromium together act more powerfully than either one separately, resulting in greater strength and hardness when a proper balance is attained. The ratios given are from 2 to 3 parts of nickel to one of chromium. The 2 to 1 ratio gives great strength and hardness, and the 3 to 1 ratio gives great toughness.

A low nickel-chromium steel containing from 1.00 to 1.50 per cent of nickel, 0.45 to 0.75 per cent of chromium, and 0.30 to 0.80 per cent of manganese is used throughout the carbon ranges for case-hardened parts and for forgings where high tensile strength is required. Steel with from 3 to 5 per cent of nickel, 1.50 to 2.25 per cent of chromium, and 0.30 to 0.40 per cent of carbon is employed for heavy armor plate, while armor-piercing projectiles are made with steel containing 0.50 per cent nickel, 2.50 per cent chromium, and 0.50 per cent of carbon.

Nickel does not seem to benefit ordinary metal-cutting tools nor high-speed steel tools. Low nickel-chromium steel, however, with from 0.60 to 0.70 per cent of carbon, is used for pneumatic drill steel, sledges, and hatchets, and is a recognized material for drop-forging dies.

For the information given we are indebted to the International Nickel Co. and the U. S. Bureau of Standards

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Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Finding the Load Factor of a Shop

Q. Will you please explain what is meant by the load factor of a shop? Does a 60 per cent load factor rating of the power indicate that the efficiency of the motors is only 60 per cent?

A. The load factor of a plant equipped with motor drives is likely to be an extremely variable thing, and a low load factor does not necessarily mean a low efficiency. The load factor for your plant can be found readily by the following method:

Take the average number of hours per day of operation for each motor and multiply it by the full-load input of the motor in kilowatts. The latter can be taken directly from the name plate on the motor. This gives the number of kilowatt-hours per day for each motor on its full-load rating. Adding the product for all of the motors in the shop gives the total installed kilowatt-hours per day for the plant on a full-load basis.

Next divide this total number of installed kilowatt-hours per day at the full load by the number of hours per day that the plant runs. This gives the average day's kilowatt consumption if all motors were fully loaded. Finally, to find the load factor in per cent, you now divide the daily meter reading by the average kilowatts consumption if all motors were fully loaded as previously calculated.

If the motors on your machines are of sufficient power to carry the greatest load when making heavy cuts at high speed, and you are normally only running light cuts, then the load factor will normally be low. It is the same as the old machine shop problem of using a heavy machine to do light work because the shop cannot afford two machines. You can install a smaller motor on such a machine, but it would operate at an overload on heavy cuts. Each case of this kind must be settled on its own merits.

Laying Out the Small Shop

Q. I would like to get a layout of a machine shop in a building 40x60 ft., with a concrete floor, and a traveling crane the full length of the building. The machines will consist of one 30-in. lathe, 20-ft. long, one 25-in. lathe, 12 ft. long, one shaper, one planer, one radial drill, one power hacksaw, and one thread cutter.

A. There are so many variations to the problem of setting up a machine shop of the size you specify, that it is difficult for us to give an intelligent answer without knowing all of the factors.

In the first place the type of building will affect your layout. For a frame or brick building you will require a complete separate structure for your traveling crane. If your building is of steel you may be able to install the crane with a smaller number of changes. The crane manufacturer will furnish you with specifications for the runway and supports.

The machine layout will depend on the location of windows and other sources of light, availability of power, and the movement of work. The latter can only be told from an analysis of the work which you propose to handle. Under ordinary circumstances the machines can be driven from one single lineshaft, and suitable countershafts for each machine. Individual motor drives would, of course, be preferable, especially since you want clear space for your crane.

Take a piece of drawing paper and lay out an outline of the shop floor plan at a scale of ½ in. equals 1 ft. Then cut out of cardboard a plan of each machine at the same scale. You can then shift the miniature machines about on the shop plan until you have an arrangement to suit the best movement of work, at the same time taking care of all clearances and passageways.

Names Used for Sales Distributors

Q. We are confused in the every day mail by terms used in different ways, and we should like to have a definition of the following names: Dealer, jobber, agent, representative, and manufacturers' agent.

A. A dealer is one who deals in a number of lines and reaches the ultimate consumer. He is primarily a retailer, but may wholesale. It is a general word, and it is possible for the dealer to be at the same time an agent, a representative, or a manufacturers' agent, according to his contracts or agreements.

A jobber, as the word is now generally used, simply means a wholesaler. The jobber, strictly speaking, handles large lots and never retails.

There is a fine point of distinction between the terms agent and representative, although the words are often abused or used interchangeably. A true agent is one who acts for another, and in such case his actions would be binding on the latter, but in commercial practice the term agent is applied to any individual or firm that holds one or more accounts for a given district. Sometimes the agent has power to act for the manufacturer, but often the name implies nothing more than the right to distribute in a territory. A manufacturers' agent is usually an individual or company that acts as distributing agents for a few manufacturers in a given territory. A well-established manufacturers' agent ordinarily will not take a manufacturer's account unless the latter will give a firm and exclusive contract, usually with a power of attorney where the distance from the factory is great. The manufacturers' agent is actually a legal agent and a representative of each manufacturer for the given district. He takes orders for distribution as he sees fit, sometimes carries stock, but never retails.

A true representative is an agent with power of attorney, and with full power to act for the manufacturer in anything pertaining to sales in a given territory. The term is often abused and used interchangeably with the word agent.

Technical Abstracts

Motors for Machine Tools

Many advantages are gained by designing a machine tool as a unit. The proper motor and control can be built into the machine. The conduit can be run inside the frame to outlet points that do not mar the general appearance. After the work is completed the machine can be tested as a unit, and the builder knows that it is right before it leaves the test floor.

The purchaser also gains. He obtains a machine which the builder has completed in all respects, and for this reason there is no divided responsibility. The machine will meet all safety rules, and will require only the running of line leads to it. The time saved in waiting for the machine to be wired on the premises will often pay for the extra charge that the builder will have to make.—C. C. Runner, in the *General Electric Review*, Sept., 1926, p. 606.

Oil-Electric Railroad Cars

The Boston & Maine R.R. is now operating fourteen oil electric passenger cars and has ordered ten more. The cars are of all-steel construction and have smoking compartments and space for baggage.

The power plant consists of a six-cylinder gas engine which operates on a low-grade fuel oil, such as distillate. The engine develops 275 hp. at 1,000 r.p.m. and is directly coupled to a 180-kw. d. c. generator.

Two radiators are used for cooling. One is of the automobile type and is at the front end of the car. The other radiator consists of a series of pipes provided with fins for increased radiation and is placed on the roof. A fan draws air through the automobile-type radiator and exhausts it through the radiator on the roof. Water does not circulate through the roof unit, except when the engine is running, thus eliminating the danger of the roof unit freezing in cold weather when the car is standing idle.

The hot-water car heating-system is connected to the radiator system, so that the end radiator can be kept warm in cold weather. — *Railway Mechanical Engineer*, September 1926, p. 528.

Modernizing Old Heating Systems

While many heating installations are revamped every year, there are still numerous plants in daily operation that are obsolete by comparison with attainable present-day standards. The modernization of the heating installation is usually postponed until the old plant is completely worn out, and is replaced only when it is inoperable, instead of as soon as it becomes obsolete.

Industry has learned that it pays to discard obsolete machine tools by comparing the productivity of the old with the new. Many examples of the saving to be made through modernizing obsolete heating plants come to light each year. Several surveys of modernized heating installations, made by a firm of consulting engineers of Chicago, showed savings in fuel, and greatly increased production of the employees on account of better heating condition.

In one factory where a gravity-return system was installed, it was found impossible to maintain a comfortable temperature during the cold weather. The plant was changed over to a vacuum-return system, and excellent results were obtained. The engineer was able to maintain a uniform temperature of 70 to 75 deg. F. throughout the factory during working hours. Fuel costs in this case were not cut, but the increased production of the 250 employees was estimated at 5 per cent, and an improved spirit toward the management was engendered by the more comfortable working conditions.—*The Heating and Ventilating Engineer*, Sept. 1926, p. 78.

Methods of Correcting Power Factor

The solution of the power factor problem consists largely in eliminating or balancing induction motor magnetizing currents. Less correction is necessary if some of the induction motors can be replaced by types of motors that supply an excess of magnetizing current. Four different types of equipment are available for use in power factor correction: synchronous motors, Fynn-Weichsel motors, static condensers and synchronous condensers.

Synchronous motors are useful where units of over 50 hp. are in use. They can be applied to air compressors, blowers, pumps, motor-generator sets and drives where the starting torque is less than half full-load torque. They are built with 80, 90 and 100 per cent ratings, the first two being available for power factor correction.

Fynn-Weichsel motors have a wide application for power factor correction because of their high starting torque, ranging from 150 per cent of full-load torque to considerably more in some ratings.

Static condensers can be used where operating conditions make it impossible to use either of the means just mentioned. The multiple-unit type is preferred because of lower initial cost and maintenance charges. Synchronous condensers are seldom used in industrial plants because of the relatively heavy losses and high cost.

Conditions are often found where the best method of power factor correction is a combination of two or more of the means given. Electric heating units aid in raising the power factor of a plant because they operate at a unity power factor.—James B. Holston in *Industrial Engineer*, Sept. 1926, p. 409.

Selling Production Ideas

One of the chief reasons why so many of the recommendations of engineers are not acted upon, and why they do not obtain the equipment they want, is that they are not salesmen enough. The very qualities and traits acquired through long study and practice, which are responsible for the success of the engineer as an engineer, is a hindrance in selling.

The nature of the engineer's work makes him reserved, modest and deliberate. This is partly why the engineer often fails to "put over" an idea that has everything to recommend it. The engineer should endeavor to add to his knowledge of machines and materials a knowledge of salesmanship.

The engineer is primarily concerned with accomplishing a given purpose. The executive thinks in terms of dollars and cents, output, and cost per ton or per thousand pieces. If the engineer puts his problem on the basis of increased capacity, or getting the most work out at the lowest ultimate cost, he will immediately have the interest of the executive. — *Steam Power*, Sept., 1926, p. 8.

Handling Fuel Oil from Car to Burner

Fuel oil of 10 to 20-deg. Bé. gravity is known as "heavy fuel oil" and requires pre-conditioning before it reaches the burner. If too cold, it burns inefficiently with a long smoky flame. If too hot, it starts to vaporize and causes the burner to sputter and even go out altogether for short intervals. In getting fuel oil from the tank car provision must be made to heat it so that it can be pumped. A strainer or dirt collector should be placed between tank and pump. The steam coils in the pump suction tank should be under thermostatic control that will hold the oil within a degree or two of the optimum temperature. The service pump should be of the reciprocating type and installed in duplicate. The strainer between pump and burner should have openings but little smaller than the burner orifice. The discharge line should form a loop feeding all burners. It is equipped with a pressure relief valve, and a lock shield needle valve near the last burner. A constant circulation of oil is kept up through the loop, any that escapes through either valve being piped back to the suction tank.—W. C. Kammerer in *Fuels and Furnaces*, Sept., 1926, p. 333.

American Machinist

KENNETH H. CONDIT AND FRED H. COLVIN
Editors

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Co-operation Is in the Air

FROM every direction come evidences of the spirit of co-operation that pervades the Western world. A new cartel of steel makers in four European countries typifies one form of joint endeavor. The decision of certain American labor unions to cast their lot with an international body is another. A recently formed trade association that will bring together practically all of the manufacturers of all kinds of electrical goods is a third.

It would not be correct to say that the various groups mentioned are activated by the same idea. Some combinations are offensive, others strictly defensive. Politics enters into a few while more are strictly commercial. Not all of these co-operative movements will be for the general good but at least the tendency to work together to a common end is far better than the belligerent individualism that leads to wars.

Unfortunately, the co-operation, particularly that in Europe, is along class lines. If some way could be found to bring employer and employee together in a common cause, the resulting benefits would greatly exceed any good that may be attained by a cartel. It is perhaps not an unduly optimistic hope that such co-operation is nearer now than it has ever been. Visitors to the United States have seen what can be done in an industrial plant when everybody pulls together and the object lesson afforded will do more to convince them than tons of inspirational literature.

Vacations in the Shop

NOW that the vacation season is over, it is time to begin planning policies for next year. Under the old régime few machine shops gave vacations with pay to shop men or foremen, but there is a growing tendency to give to the man in the shop something of the same vacation privilege that has been accorded the office employee for many years.

One of the New England machine tool builders employing about 3,000 men has a shop vacation plan that has now been in force for seven years, and that seems to be bringing results. This company grants one week's vacation with pay to all shop employees who have been three years with the company, and two weeks with pay to all foremen who were appointed prior to Jan. 1 of the same year. Assistant foremen who have served for five years as assistant foremen also receive two weeks' vacation with pay. In 1926 fifty-eight per cent of the entire force of the plant received vacations under this established ruling.

This schedule may not be applicable to all shops. Variations may have to be made to suit other conditions of work or location. But something on this order sounds reasonable.

The Small Shop and Consolidations

CONSOLIDATIONS are likely to be of benefit to the small manufacturer who has no part in them. There are usually greater wastes, and more complications of management, in the extremely large organization than in the relatively small. Such losses can be prevented by the careful small manufacturer, who can give personal attention quickly where it is needed. Simplification and standardization have tended toward equalization of the opportunities of manufacturers of all sizes.

The effect of individual initiative is great in the small plant, where the head comprehends the entire business, and where, in great measure, his business is his life. It is from such a plant that more personal attention is likely to be given to customers, a condition in itself a valuable aid to the business.

Hand-to-Mouth Buying Has Its Good Points

HAND-TO-MOUTH buying is more of an asset than a detriment at present. It has stabilized distribution through reduction of inventory and capital invested, and has benefited the manufacturer by reducing his commitments.

Obviously one of the results is the absence of cancellations, an advantage to the distributor, and a boon to the manufacturer. Ordinarily forced to accept cancellations, yet obligated by his own orders for raw materials, the manufacturer is in a better position when running on short commitments.

There is, moreover, probably a worthwhile influence in favor of simplification and standardization. To meet the requirements of the buyers, manufacturers must produce for stock rather than to individual specifications. Following that plan economically means fewer varieties and sizes, and those made to standards.

Hand-to-mouth buying, if carried on for a protracted period, may be calamitous because of very uneasiness. Or it may become an accepted condition because of long life. The time to observe its effects is now, and the time to worry is not yet.

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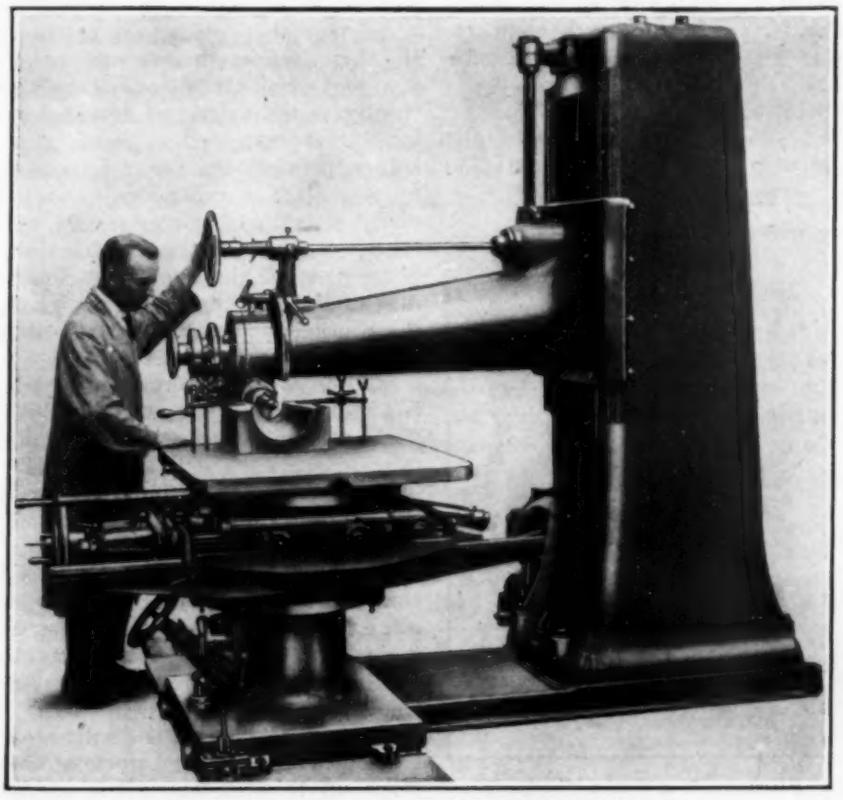
Wadkin "Semi-Auto" Universal Wood Miller

The Wadkin "Semi-Auto" universal wood miller of improved design, shown in the accompanying illustration, is being marketed in this country by Charles A. Streling Co., 155 E. Kirby Ave., Detroit, Mich. The machine is manufactured by Wadkin & Co., North Evington, Leicester, England. It is particularly adapted for pattern work. All its motions are under hand and power control, and it is fitted with scales and micrometer feeds to facilitate the production of accurate surfaces. It is claimed that it is readily adaptable to work of any nature, and can be quickly changed over from one operation to another.

The main frame is a heavy casting, having accurately machined slide ways to receive the overhanging arm that carries the spindle head. The arm can be raised or lowered either by power or hand feed. It is said that it is absolutely rigid under even the heaviest cut.

The spindle head carried on the overhanging arm swivels between the vertical and horizontal in either direction. The principal angles are indexed and located by means of a spring-plunger taper pin that engages with suitable holes. The head can be locked in intermediate angles by means of a convenient locking handle. The cutter spindle is made of special quality steel, and the chuck is forged solid with it. It is bored for a No. 5 Morse taper. The back end is tapped out for a screw tang. A safety screw engages with a suitable flat on the taper tang when it is inserted in the chuck, so that safety is assured to the operator. The spindle runs in heavy-duty ball bearings and the thrust is also taken by ball bearings of ample size.



Wadkin "Semi-Auto" Universal Wood Miller

By means of a handwheel on the capstan head, the direction of rotation of the spindle may be reversed. The same handwheel controls the starting and stopping of the spindle. It is said that this reversing takes place rapidly, since the revolving mass weighs only about 28 lb. Concentric with this control wheel is a hand lever that controls the feed gear for the cutter spindle. It is arranged with a spring plunger to give definite depth of feed. It is provided also with limit stops. In addition, a micrometer hand feed is fitted to give fine readings.

The cutter spindle is driven by means of a worm and wheel totally inclosed and running in grease. With this type of drive, the cutter spindle is placed below the level of the arm, so that the spindle is allowed to enter a corebox with its axis parallel to the surface of the work. For the same reason, the cutters can be carried close to the bearing and long boring bars can be dispensed with. This drive also enables the spindle to be put in any angular position, thus saving the time necessary to reset work and increasing the range of application of the cutters.

The driving-gear spindle that carries the wormwheel is mounted inside the arm and revolves on heavy-duty ball bearings. On the other end of this spindle and inside the main frame are two clutch pulleys, running in opposite directions and driven by an endless "Hendry" laminated belt. It is through these clutches that reversal of the work spindle is obtained.

Three speeds of the work spindle are provided, so that a suitable speed can be selected for the particular type and size of cutter that is being used. The variation in speed is obtained from a gear box mounted on the side of the main frame. The gearing is of steel and is totally inclosed. All the gear spindles are mounted upon ball bearings.

The overhanging arm is provided with both power- and hand-raising motion. The power motion is controlled by a lever, close to the capstan head and within easy reach of the operator, that controls two clutch

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pulleys revolving in opposite directions and driven by an endless belt, as in the case of the spindle drive. The hand motion of the arm is obtained by means of a handwheel and shaft shown above the arm.

The work table has two motions at right angles, both of which are operated by screw and handwheel. The screw nut of the cross motion is split to enable the table to be operated either by the screw or floated to and fro by hand when the operator is dealing with light work. This table is mounted on ball bearings to give free and easy movement. A rotary movement is also provided for handling all kinds of circular and radius work. Indexing to all the principal angles is obtained by means of a spring-plunger taper pin that engages in suitable holes.

The table is graduated for conveniently setting the work. Its center is recessed so that cutters may be lowered beneath the surface of the table. A cover plate fits over this recess when not in use. The combined table motions can be read direct from contraction or standard rules. Suitable spring and dead stops are provided.

In addition to the above movements, a secondary rotary motion is provided in the table body frame, on which the compound slides are mounted. With this construction the work table and slide can be turned to any desired angle, the principal ones of which are located by means of a spring plunger. Any intermediate angles may be secured by a locking handle.

The table body frame is mounted on anti-friction rollers and travels along the foundation frame rail. This movement is controlled by means of a conveniently placed handwheel and a quick-acting lever to lock the table body in any position. The foundation frame rail is 24 in. wide and 10 ft. 0 in. long. It is bolted to the main stand and is placed across the frame of the machine and under the arm and cutter spindle. The table body frame can be moved to any required position to suit the work in hand.

The machine is driven by means of a belt running on a tight and loose pulley mounted on the three-speed gear box at the base of the main frame. The drive may be from practically any direction. When required, the machine can be driven by electric motor. With a direct-current motor, the three-speed gear box is dispensed with, and a bearing bracket is placed in its stead to provide support for the motor coupling. The motor itself is mounted on a pedestal which is bolted to the main frame. With an alternating-current motor, the three-speed gear box is maintained and the motor is mounted on a pedestal suited to this type of drive. In either case, a 4-hp. motor is recommended; a variable-speed motor from 450 to 1,100 r.p.m. for d.c. work, and a constant-speed motor at 1,000 r.p.m. for a.c. work.

SPECIFICATIONS

Center of cutter spindle to face of body frame	48 in.
Height of table from floor	36 in.
Size of work table	35½x32 in.
Longitudinal traverse of work table	36 in.
Lateral traverse of work table	24 in.
Total movement of table along rails	7 ft. 3 in.
Length of table rails	10 ft. 0 in.
Mechanically controlled limit of radius work	48 in.
Maximum height between cutter spindle and work table, spindle horizontal	24 in.
Maximum height between cutter spindle chuck and work table, spindle vertical	19½ in.
Center of cutter spindle below underside of arm	2½ in.
Lever feed of cutter spindle	3 in.
Approximate floor space with maximum movements	10 ft. 9 in. x 10 ft. 9 in.
Speeds of cutter spindle r.p.m.	3,630, 1,815 and 907
Speed of raising and lowering motion of arm	7¼, 14½ and 29 in. per min.
Net weight	6,700 lb.

Bausch & Lomb Toolmakers' Microscope

The toolmakers' microscope illustrated is being marketed by the Bausch & Lomb Optical Co., Rochester, N. Y. Fig. 1 shows the microscope with a regular eyepiece, while Fig. 2 shows the microscope with a vertical illuminator and illuminating lamp. The instrument is rugged and sturdy in design and is adapted to the workshop and laboratory.

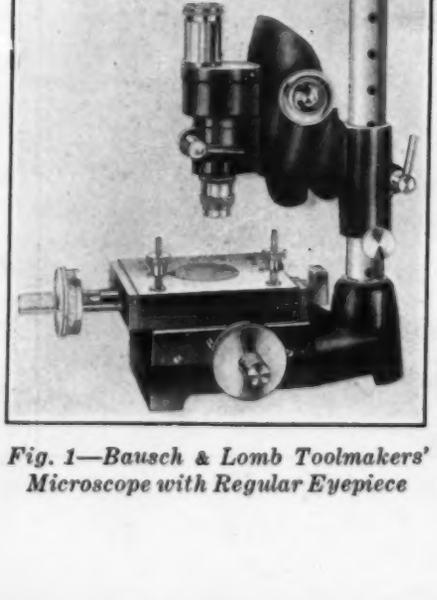

Fig. 1—Bausch & Lomb Toolmakers' Microscope with Regular Eyepiece

The principle of operation is as follows: The operator places the part to be examined on the cross-slide stage and clamps it in position. He then focuses the microscope on the part, and the image appears right side up instead of reversed as in the ordinary microscope. One side or point of the object is located by means of a cross line, and by means of two micrometer screws, the other edge or extremity can be brought under the cross line. Readings of the micrometer screws gives the dimension measured. The base of the instrument carries the compound cross slide actuated by the two measuring screws, while the vertical column carries an erecting microscope.

Depending upon the objective used, the magnification is either 32 or 88 times. The eyepiece regularly supplied gives a magnification of 7½ times. The objectives are 32 and 16 mm.e.f. Other objectives and eyepieces may be used to obtain magnifications ranging from 20 to 200 times or greater.

The vertical column is a solid steel bar, and it permits any working distance up to 6 in. above the microscope stage. Focus adjustment of

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the microscope is by means of a rack and pinion which is inclosed in a pliable leather bag so as to protect it from dust and dirt.

In the focal plane of the eyepiece is a special cross line disk. The cross lines are interrupted every 0.2 mm. with a space of 0.1 mm. between. These cross lines intersect at the center of the field at angles of 30, 60, 90, 120 and 150 deg. respectively. The eyepiece is provided with an adjustable lens for focusing sharply on these cross lines. By interrupting the lines, they appear black even against a poorly illuminated object. For measuring threads or for other work where the center of the line is used, the clear opening between the short lines permits setting to an imaginary middle line established between two edges of the solid line.

The cross-slide stage of the microscope has a range of 1 in. in either direction in the horizontal plane, the two movements being at right angles to one another. This stage rests on ball bearings which are said to assure a straight and almost frictionless motion of the stage. A pair of weak springs push the slides against a pair of thrust pins which in turn rest against the measuring screws. The thrust pin is said to provide a reliable contact, and the error caused by wear or by a slight discrepancy in alignment is negligible.

The micrometer screws by which the cross slide is actuated are carefully tested and selected for accuracy. The contact points are of semi-spherical form to assure the accurate transmission of the linear movement of the screws to the cross stage. A direct reading to an accuracy of 0.0001 in. is obtained by means of a graduated drum attached to the micrometer head.

Where greater accuracy in measurement is required, standard thickness gages such as Johannson blocks may be used instead of the micrometer drums. The measurement is then comparative and the micrometer screw is used merely to move the cross slide stage. The stage is made to rest directly against the Johannson block under spring pressure, while the block is carefully placed in its special holder. A slow rotation of the micrometer screw transfers the slight pressure from the micrometer to the measuring block.

Two convenient object clamps are provided for securing the object examined to the stage. Sixteen holes threaded for 0.140 in. times 36 A.S.M.E. threads per in. are placed around the stage so that the object clamps may be held in any required position. For very large or irregular-shaped objects, special clamps can be made for the set-ups with the aid of these holes.

In order to illuminate the object a stream of light is guided from the rear of the base of the microscope by means of a train of mirrors and

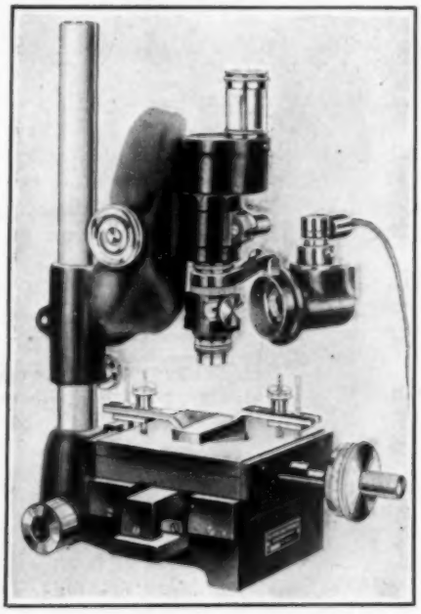


Fig. 2—Microscope with Vertical Illuminator Attachment

a condenser lens upward through the slide stage and on into the field of vision of the microscope. A cover glass flush with the upper surface of the cross slide stage protects the slides from dust and serves as an object carrier.

Opaque objects must be viewed by light falling from above on the surface to be examined. For this purpose, a vertical illuminator, illustrated in Fig. 2, is adapted. It is screwed into the microscope tube in place of the objective, and then the objective is screwed into the illuminator. This device consists of a plano glass reflector so mounted as to be readily adjusted by means of a knurled head at the side. This reflector diverts light from any convenient source at the side down through the objective and on to the object, where the light is reflected back into the observer's eye.

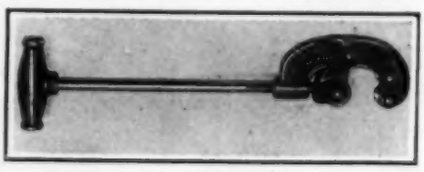
Vertical illuminator lamp No. 4605, also shown in Fig. 2, may be used as this light source. It is attached to the lower end of the microscope by means of a single nosepiece and a bracket so that it moves up and down with the body of the tube during the focusing. The lamp may be used either for directing the light into the illuminator, as shown, or for oblique illumination of the object. The light source used in this lamp is a 6-volt, 12-cp. light, which can be operated from a storage battery or from a house-lighting circuit, when connected in series with a suitable resistance or transformer.

Other attachments are also furnished. A lead-measuring attachment is used for measuring the lead of threads on taps, screws, and gages. By means of a protractor eyepiece, helix angles of threads can be read, and the tilt of the screw can also be measured. With the use of a thread-diameter measuring attachment, the actual outside diameter, the sharp or theoretical outside diameter, the root diameter, the sharp or theoretical root diameter, and the pitch diameter of a screw can be measured.

Oster Saunders-Type Pipe Cutter, Improved

The Oster Manufacturing Co., Cleveland, Ohio, is marketing the improved Saunders-type cutter illustrated. The cutter is made in two sizes. The small size covers a range of pipe from ⅛ to 1 in. nominal size, while the large cutter cuts pipe ranging from ¼ to 2 in. nominal size. It can be used for either hand or power work.

The cutter wheel is of large diameter, and instead of being directly above the center of the two rollers it is placed slightly off center. With this construction, it is claimed that the tool will cut off pipe much



Oster Saunders-Type Pipe Cutter

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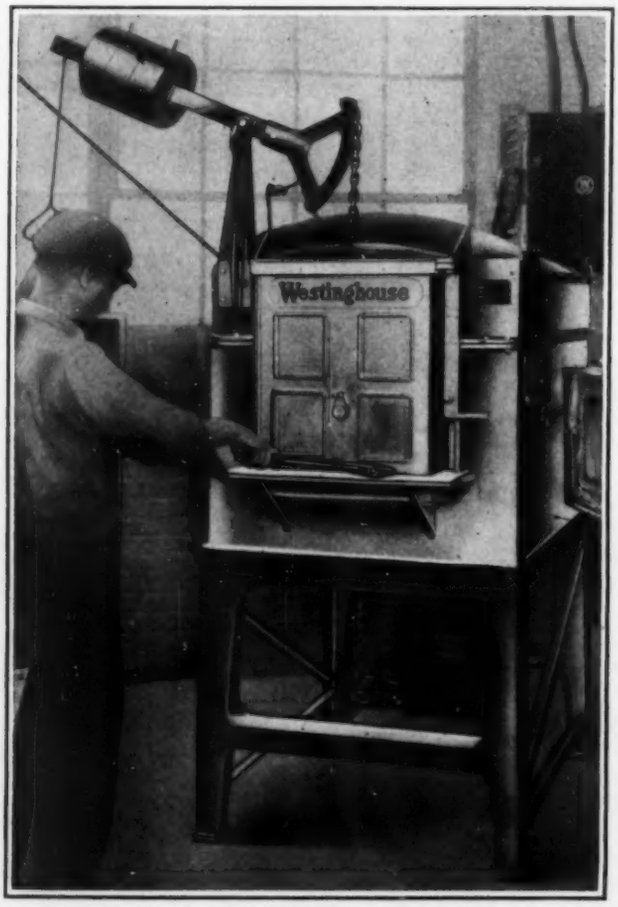
more rapidly and with less pressure on the screw than would ordinarily be the case. The I-beam section on the handle gives the tool the necessary strength for power use. The handle is made of certified malleable iron, while the cutter wheel, the rollers and pins are made of high-grade tool steel to insure long life. It is said that the tool will track readily when turned by a mechanical drive.

Westinghouse Box-Type Electric Furnace, Type H

The box- or hearth-type electric furnace illustrated is being manufactured by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The furnace is particularly applicable to production work in plants for the heat-treating of machine parts and for tempering lathe and planer tools, dies and punches, and the like.

The furnace is constructed of a shell of heavy boiler plate, riveted and bolted to a structural steel frame, with heavy front castings. Within this shell the heat insulation material and the heating chamber is inclosed. The entire roof is assembled in a frame and bolted to the lower portion of the shell. This construction allows the roof to be lifted and swung to one side for the inspection or repair of the lining and the heating elements.

The direct radiating heating elements, made of nickel-chromium, are open but protected, and are assembled in a frame of the same metal. They may be readily removed, if necessary. A cast nickel-chromium floor plate distributes the heat evenly and protects the bottom elements. It also forms a smooth surface for handling the material in and out of the combustion chamber.



Westinghouse Box-Type Electric Furnace, Type H

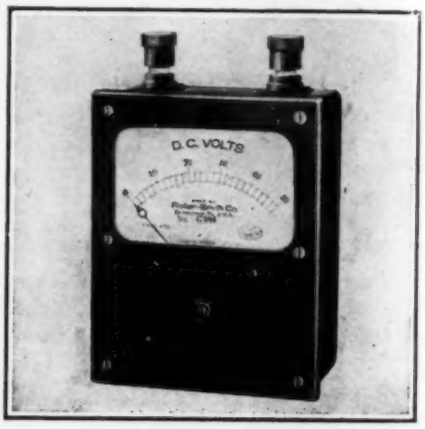
By means of automatic regulation, the furnace can be controlled within close temperature limits, which can be fixed up to a maximum of 1,850 deg. F. This automatic temperature regulation is said to result in economy of operation, since it eliminates improperly heated charges and reduces the operator's time in attendance.

Three sizes of furnaces are built, having capacities, at 1,500 deg. F., of 100, 240 and 360 lb. of steel per hour, with power consumption of 15, 27 and 40 kw., respectively. The smallest and the middle size furnaces are for use on single-phase, 110-volt current, while the largest size is designed for 1, 2 or 3-phase, 220-volt current.

Roller-Smith Portable Instruments, Types HTD and HTA

The portable instrument illustrated is being made by the Roller-Smith Co., 233 Broadway, New York, N. Y., in types HTD and HTA for use with direct and alternating current, respectively. The dimensions of the instrument are 3$\frac{5}{32}$ in. wide, 4$\frac{1}{2}$ in. high and 1$\frac{1}{2}$ in. deep, so that it is fully portable.

The cases are made of light but rigid metal with black rubberoid finish. They are so constructed as to be practically dust and moisture proof. Connections are in the form



Roller-Smith Portable Instrument

of binding posts with non-removable tops so arranged that the binding posts cannot turn. The dials are made of white bristol board, and the scales are drawn in by hand in accordance with the characteristics of each instrument. Non-fading black india ink is used in all types. The scales have uniform divisions in the direct-current instruments.

All instruments are provided with a convenient zero adjuster. The pointers are made of aluminum and are light and rigid. The springs controlling them are made of phosphor-bronze, well aged to minimize zero shifting. The movable parts are so mounted that they cannot get out of alignment with rough handling. The mechanisms are the permanent-magnet, moving-coil type. They are said to be accurate within 1 per cent of the full scale value in the direct current and within 1$\frac{1}{2}$ per cent of the value in the alternating current instruments.

The type HTD instruments are

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made with ammeter, milli-ammeter, voltmeter, milli-voltmeter and volt-ammeter scales. In the last case two sets of binding posts are provided. With suitable shunts, ranges of 0 to 5 up to a range of 0 to 800 milli-ammeters can be obtained. A range of 0 to 1 up to and including 0 to 200 amperes are also available. Voltage ranges of 0 to 1.5 and 0 to 300 can be obtained. The milli-volt ranges vary between 50 and 500.

The type HTA a.c. instruments are furnished with ammeter, milli-ammeter and voltmeter scales. With suitable shunts, 100 to 800 milli-ammeter scale ranges can be obtained, or 1 to 50 ampere scale ranges. The voltage ranges are 0 to 10 volts up to and including 0 to 300 volts, when used with suitable external resistances.

Carborundum Segmental Wheel Chuck Improved

The Carborundum Co., Niagara Falls, N. Y., is marketing the improved segmental wheel chuck shown in the accompanying illustration. The chuck is made by Pratt & Whitney Co. and is provided with Carborundum or Aloxite, two abrasives manufactured by the Carborundum Co. It is claimed that the advantages of the segmental type of wheel lie not only in its ability to give a free, clean, shear-cutting action with plenty of clearance and its ability to give increased grinding production, but also in the fact that the initial cost of the segmental wheel is from 25 to 40 per cent less than that of the solid wheel.

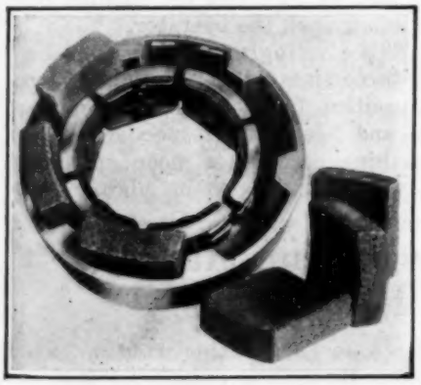

Fig. 1—Carborundum Segmental Wheel Chuck

Th chuck is of a heavy-duty type and is designed for production work. It provides for the mechanical holding of segments by means of a series of clamping bolts and rocker bearing blocks within a heavy ring or chuck body, which is designed to provide strength and rigidity. The chuck body and the clamps are made of a special close-grained "gun-iron," which is claimed to have great tensile strength. As shown in Fig. 1, the segments are mounted in pockets inside of the chuck body and the centrifugal force, the crushing strain, and the driving force are absorbed by the chuck body in three directions, so that the strain on the clamps is comparatively slight. This construction is said to give a maximum factor of safety. A series of rocker blocks in the chuck body and on the faces of the inside clamps automatically compensate for any irregularities in the segments.

The clamping bolts are made of heat-treated, stainless steel and the rocker blocks are bronze castings. Both these materials are rust proof, and their use insures good working conditions at all times.

Each segment is held in position by independent clamps on both ends and as the curvatures of the outside and inside of the segments are concentric, any crushing tendencies of the end or consequent endwise movement of the segments while under strain do not tend to loosen the hold of the clamps. It is also said that there is little danger of cracking or chipping the segments by applying too much pressure to the clamps. When new the segments rest directly on the bottom of the chuck, and, when worn and reset in the second position, they rest on the top of the inner clamps which are pulled forward by means of bolts provided for that purpose. In either case the segments are driven by the heavy partitions integral with the chuck body.

When new the segments project 2¼ in. beyond the mouth of the chuck. When they are worn and reset in the second position, they project 2 in. For still another position adapters are provided. These are extra holders into which the worn segments are securely held by means of a sulphur bond. The adapters are then mounted in the chuck and the segments can be used until worn down to ¾ in. In Fig. 2 this arrangement is shown.

In order to obtain an increased supply of water directly at the point of contact between the wheel and the work, the segments are tilted outward from the axis by a slight amount. This flare arrangement takes advantage of the centrifugal force effect in the water, in addition to its directional influence. It is also said that the tilting of the segments prevents water from climbing over the wheel guards. Besides this, it makes it possible to grind close up to projections on the work.

Adjustment of the chuck is all on the outside so the operator need not reach inside the chuck in order to adjust it. All clamping bolt heads and adjusting screws are sunk below the surface of the chuck, which is left free from outside projections.

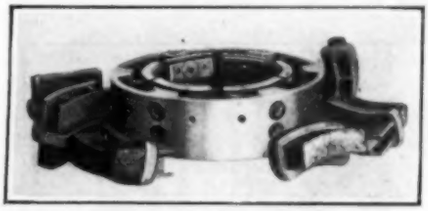

Fig. 2—Chuck ring with segments set in adapters

Wheel chucks are available in sizes from 18 to 30 in. in diameter, using from 6 to 11 segments according to size. A single size of segment is used for all sizes of chucks. These segments are 6 in. long, 7 in. high, with a 2-in. face. They are curved on a diameter of 22 in. both inside and outside. With this construction the problem of stocking for various sizes of chucks is a simple one.

Carborundum segments are recommended for the surfacing of cast iron, brass, bronze, aluminum, and other metals of low tensile strength. For the surfacing of steels, malleables, and metals of high tensile strength, Aloxite segments are recommended. They can be supplied in all standard grits ranging from 16 to 30, depending upon the class of work and the finish desired.

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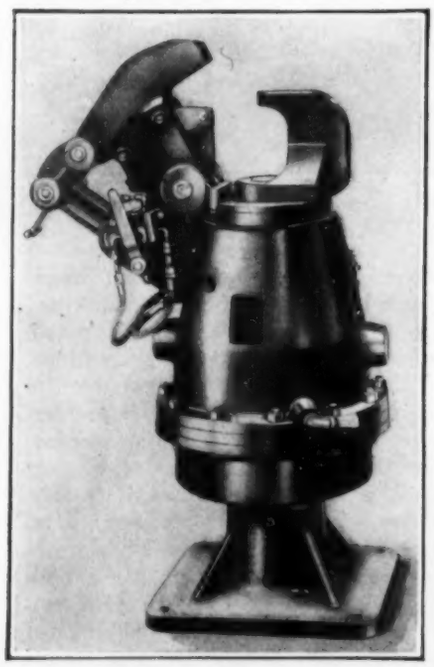
Hanna Closed-Yoke Riveter

The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has designed another riveter especially suited for automotive chassis work. The turret riveter was described on page 838, Vol. 64, of the *American Machinist*. The present model is called a Closed-Yoke riveter and is illustrated in the accompanying photograph. Its function is to drive the vertical rivets in the upper flange of a chassis-frame side bar, rail or channel, to which the cross members are attached in the final assembly.

The chassis frame is conveyed to the riveter on a monorail suspension rigging and is held in the position it assumes in the automobile. Its side bar channels are always on edge with the webs facing outwards and the flange pointing toward the center of the chassis frame.

The inner lower swiveling die or nose is horn-shaped to hook around



Hanna Closed-Yoke Riveter

the lower flange of the channel and to enter from the bottom and inside of the chassis frame into the throat of the channel below the upper flange. The nose swivels upon a vertical axis and, therefore, can be placed in various positions so as to avoid interference with the sides of the cross members, brackets, etc., on the inside of the frame. The die alignment is not affected by this swiveling action, as the axis of rotation passes through the center of the die.

The outer, upper jaw or nose hooks over and outside the side-bar channel, and for this reason it rarely meets with interference. The throat stands away from the outside face of the channel so as to avoid brackets and the like. During the riveting power stroke the lower nose is stationary, while the upper jaw moves. The length of stroke is 1½ in. in a straight line. When pressure is applied, the inner and outer noses completely inclose the channel, as the name of the machine implies. This short die stroke is effective even when channels 7 in. in depth are being riveted, since the outer jaw swings outward instead of upward. This swing movement is accomplished by means of toggles that are air actuated. They are self-locking against the riveting pressure, since they swing beyond dead center against a solid stop. Control of the air valve that actuates the toggle mechanism is by means of a handle mounted on the side of the outer jaw head. This opening and closing action is said to require less than a second in actual riveting time.

The riveter is mounted upon a swivel base, which permits the entire machine to rotate about a vertical axis. It may also be equipped with a trunnion stand that supports the riveter at the two bosses shown on the sides of the cylinder. With this mounting, the riveter can be tilted so that the die axis conforms to rivets in a chassis frame that are at an angle. A mounting that combines swivel and tilt is also available.

Movement of the riveting mechanism is controlled by means of a foot-operated valve. By stepping on a heel pedal, the operator advances the die. When his heel is lifted, the valve is reversed and the die returns. The operating valve combines a soft disk-type poppet valve with a spool-type distributor valve. The poppet is seated when the heel pedal is centralized and air is shut off at the inlet. Due to the ease with which the valve is actuated, combined with the rapid riveting mechanism and quick indexing, the riveter is capable of being operated as fast as 50 cycles per minute, depending upon the operator.

This riveting machine is available in three sizes of 10-, 15- and 20-ton capacities for cold riveting of ½-, ⅝- and ¾-in. rivets respectively. The machine occupies a floor space of 22x22 in. and is 45 in. high.

Lapointe Special Broaching Machine No. 4

The No. 4 special broaching machine illustrated is being marketed by the J. N. Lapointe Co., New London, Conn. It has a maximum stroke of 102 in. and a pulling capacity of 73,000 lb. with 1,000 lb. per sq.in. of oil on the piston, 10½ in. in diameter. The maximum speed of the cutting stroke is 15 ft. per min., with a speed of return that can be varied from 10 to 180 ft. per minute.

Oil pressure to move the draw-rod is supplied by a Waterbury variable-delivery pump, coupled directly to a standard electric motor. The power unit is mounted on the extended base of the cabinet leg, as shown in the illustration, thus making a compact and self-contained outfit.

The weight of the outer end of the draw-rod is supported by and slides through a cross-head that is gibbed to slide upon the main frame. On the outward stroke, the movement of the cross-head is arrested by fixed stops while the rod continues to move until the draw-head extends beyond the fixture and work so that the broach may be attached. On the cutting stroke, the cross-head is picked up by a shoulder on the draw-rod and is moved forward with it to the end of the stroke.

The end of the main frame has three machined bosses, to which any kind of special work-holding fixture may be attached. As shown in the illustration, the machine is fitted to broach the splineways in long tubes of comparatively small diameter, and the fixture takes the form of a

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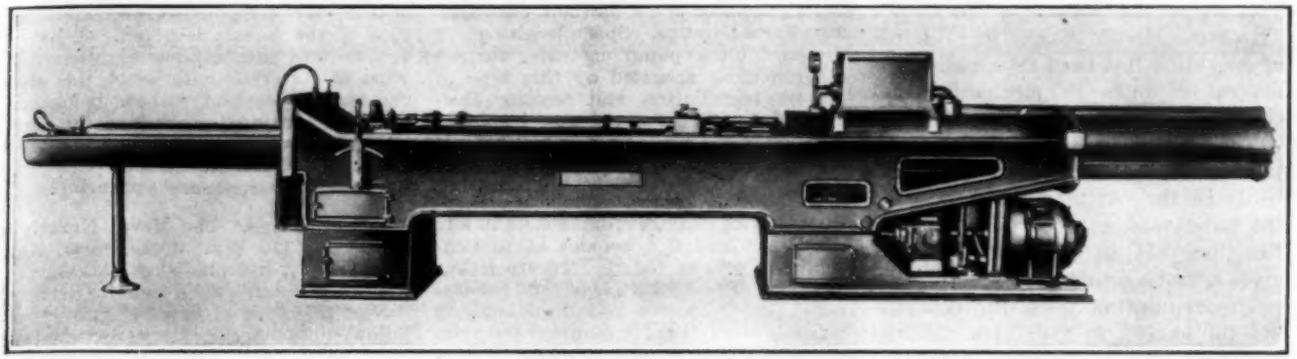


Lapointe Special Broaching Machine, No. 4

trough to return the oil or cutting compound to the tank in the base.

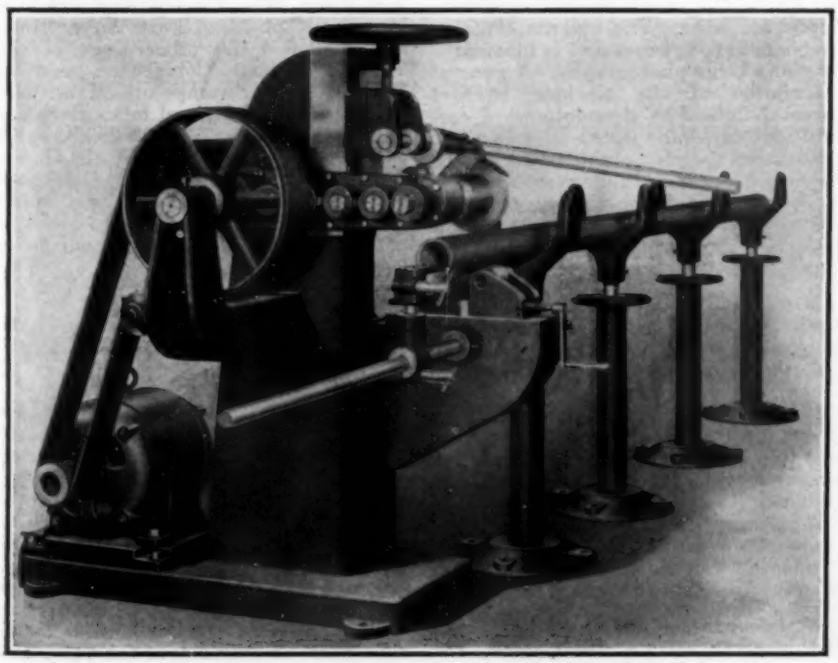
The tank for containing the compound is removable through the lower door, and it is covered by a screen through which the returned compound must pass. By opening the upper door the screen may be removed for cleaning or the accumulated chips may be raked out without removing the screen. A circulating coolant pump is provided.

"Steen" High-Speed Pipe and Tube Cutter

The Continental Machine Co., 2002 Clybourn Ave., Chicago, Ill., is marking the "Steen" high-speed pipe and tube cutter illustrated. The machine has a capacity for cutting pipe or tube ranging from ⅛ to 6 in. in diameter.

The machine is furnished with either belt or motor drive. The driving pulley is 16 in. in diameter by 4½ in. face. With motor drive the motor is mounted upon the base and drives the machine through a short belt and idler tightener pulley. A 3-hp. motor at 1,200 r.p.m. is regularly provided.

The cutter arm is pivoted about the driving pulley as an axis and the power is transmitted to the cutting blade through a gear train. The cutter of the knife type and is 7 in. in diameter. It is made of high-grade steel, hardened and ground. The cutter shaft is made of heat-treated alloy steel and is mounted upon roller bearings. The idler gears are bronze bushed and revolve upon high-carbon, ground steel studs.



"Steen" High-Speed Pipe and Tube Cutter

The cutter-block rolls are also mounted upon roller bearings. The rolls are made of hardened tool steel as are the roller-bearing studs. All roller bearings are lubricated by the Alemite system. The blocks holding the rolls slide in guides along the table and by means of a crank and a left- and right-hand screw the rolls may be spaced to take care of different pipe diameters.

The machine is regularly furnished with four pipe supports as shown in the illustration. These supports are adjustable as to height by means of hand wheels in order to take care of the various sizes of pipe.

The swing-cutter frame is counterbalanced with a suitable weight, and the cutting pressure is obtained by means of a lever that actuates a cam. The lever pivot is carried in an adjustable support to provide the necessary cutter travel for the specified range of pipe sizes.

The floor space occupied by the belt driven model is 32 x 36 in., while the floor space occupied by the motor driven model is 30 x 50 in. The corresponding weights are 1,650 and 1,800 lb. The pipe supports weigh 500 lb. in addition.

"Simbi" Electric Hammer Model 26

The Fermot Co., 200 Broadway, New York, N. Y., is marketing the improved "Simbi" model 26 electric hammer, illustrated. A previous model was described on page 499,

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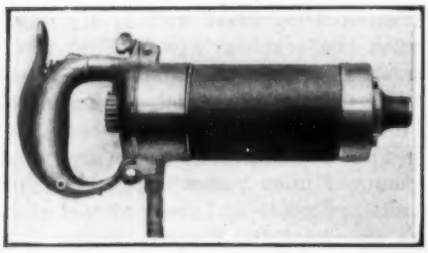
Vol. 64, of the *American Machinist*. The same electro-magnetic principle of operation has been retained, while several changes in mechanical design have been made.

The switch on the handle of the tool is controlled by thumb pressure, while in the old model the palm of the hand was used to perform this function. It is claimed that this gives a more sensitive control.

The regulating lever for controlling the spring in the former model has been replaced by a revolving knob type of regulator. A wider



"Simbi" Electric Hammer, Model 26

range of regulation is thus permitted and a longer spring is used to obtain the full possibilities of this regulation. The recoil of the vibrating plunger is taken upon this spring. The initial upward pressure to the spring is applied through the plunger by means of a spiral spring, wound edgewise, in place of a helical spring used in the former model.

The solenoid has been materially increased in size and has a larger cooling area. It is claimed that the buzzing of the hammer is greatly reduced, as well as any heating effect.

In the old model, the electric cable was attached to the handle of the hammer, while in the present design it is attached to the body, so that the operator's motions are not encumbered by the cable.

It is claimed that the efficiency of the unit has been increased by 30 per cent.

Trade Catalogs

Broaching Machines. The Oilgear Co., 655 Park St., Milwaukee, Wis., has published Bulletin No. 50 on its broaching machines. The pamphlet contains eight, 8½x11-in. pages, perforated for binding in loose-leaf form. General specifications for the No. 3 and No. 4 machines are given, together with brief descriptions of some of their outstanding characteristics. Space is also given to the Oilgear pump unit and various other devices actuated by this type of drive. Installation and tooling blueprints are given for the two machines mentioned. The booklet is well illustrated by means of photographs.

Gasoline Engines, Lubrication of. The Climax Engineering Co., Clinton, Iowa, has issued a booklet of lubrication instructions for its "Trustworthy" engines. The booklet contains twenty-eight 6x9-in. pages and is bound in paper covers. A general description of Climax engines is first given and the lubrication system is explained. Instructions for engine lubrication then follow. Such information as when to change crankcase oil, how to clean the oil screen and oil reservoir, and how to avoid other lubrication troubles such as crankcase dilution, carbon deposits, and corrosion troubles, is given. Information is also supplied on how to trace general engine troubles.

Kinite. The Kinite Corporation, 1338 St. Paul Ave., Milwaukee, Wis., has published a bulletin entitled "and then they discovered KINITE." The properties of this cast alloy of steel are explained, particularly its wear-resisting properties. Typical uses of Kinite are also stated. These include shell redrawing, shear blades, rotary shears, heavy blanking operations, light blanking and cutting operations, sectional dies, beading dies, wiring and seaming rolls, embossing and forming dies, and dies for drawing operations. The bulletin is illustrated.

Lathes, Heavy-Duty Automatic, No. 16. The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, has issued Bulletin No. ALD-2 on its No. 16 heavy-duty automatic lathe. The bulletin contains twelve 8½x11-in. pages and is illustrated by many large photographs. A general description of the machine is first given, followed by descriptions of certain outstanding parts, such as the headstock, the bed, the tailstock, the carriages and tool slides, and miscellaneous parts. Some typical examples of work that can be handled on this machine are also given. Complete specifications are appended.

Microscope, Toolmakers'. Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y., is issuing a 20-page bulletin on its new toolmakers' microscope. A very complete description of the construction of the instrument is given. Information is also furnished on how to operate the instrument, and suggestions as to the numerous possibilities of its use are given. The bulletin is profusely illustrated by means of large photographs, and the text is so divided by well-placed paragraph heads that it can readily be referred to.

Stainless Steel and Stainless Iron. Bethlehem Steel Co., Bethlehem, Pa., has published Bulletin No. 113 on its stainless steel and iron. A brief description of the composition and manufacture of the metals is given. A list of applications then follows together with a list of materials with which this steel can come in contact without being corroded. Working instructions for forging, annealing and hardening the steel and iron are also furnished. Complete physical properties are appended.

Valves, Plugs. The Merco Norstrom Valve Co., 110 West 40th Street, New York, N. Y., has published catalog No. 5 on its plug valves. A general description of this type of valve is first given, followed by specifications for the all-iron, semi-steel, cast-steel, Mercoloy, bronze, and aluminum plug valves. Special types of valves and fittings are also listed. A table of recommended lubricants for use with various liquids is given. The booklet contains sixty-four 6x9-in. pages and is profusely illustrated by means of the photographs and line cuts.

Wheels, Steel for Fordson Tractors. French & Hecht, Davenport, Iowa, has published a 16-page booklet on its built-up steel expansion wheels with rubber tires for Fordson industrial tractor service. An explanation of the construction of this wheel is first given with the aid of many illustrations, and this is followed by complete instructions as to how to mount the rubber tire over the wheel. Each step is illustrated by means of a photograph.

Pamphlets Received

Office Managers. The National Association of Office Managers, F. L. Rowland, Secy., The Lincoln National Life Insurance Company, Fort Wayne, Ind., has published the proceedings of the Seventh Annual Conference held in June, 1926, as Swampscott, Mass. All the lectures and general talks given are listed, in addition to six round-table conferences. A membership list of the association is appended. The proceedings are published in the form of an 114-page, 8½x11-in. pamphlet, bound in paper covers. The price of the booklet is $2 per copy.

Standards Adopted in 1926 by the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. Standards are published in the form of a 102-page, 6x9-in. pamphlet bound in paper covers. Under the general heading of ferrous metals, carbon and high-speed tool steel, and alloy-steel bolting material for high-temperature service are listed, while under non-ferrous metals, standard specifications for aluminum, hot-rolled copper rods and white bearing alloys are given. Cement, lime, gypsum and clay products are specified in another section. Specifications are given for miscellaneous materials such as ingredients for paint and asphalt products. The price of the pamphlet is $1.50.

News of the Week

1927 Exposition Plans Absorb Interest of Machine Tool Builders

As was to be expected the principal topic discussed by the members of the National Machine Tool Builders' Association at Lenox, October 4-6, was the exposition of machine tools to be held in Cleveland, September 19-24, 1927. It was referred to by the retiring president, H. M. Lucas, president of the Lucas Machine Tool Co., as "the beginning of co-operation by American machine tool builders in constructive merchandising, and in the reduction of competitive marketing waste." Mr. Lucas' address is printed elsewhere in this issue.

The chairman of the exposition committee, J. Wallace Carrel, Lodge & Shipley Machine Tool Co., read a report tracing the various steps taken by his committee from the time the authorizing resolution was passed up to the present. The advance guaranties of space for the 1927 show went well beyond the amount needed to insure the success of the enterprise and the committee is now embarrassed to find sufficient space for all those wanting it. Most of the original guaranties were for minimum requirements and they have been considerably expanded in many cases. The committee is also wrestling with the problem of space allotment, this matter having been referred to it after some discussion by the members.

Official business included the election of three new directors. They were Henry Buker, Brown & Sharpe Manufacturing Co.; Charles C. Swift, Ohio Machine Tool Co.; and August H. Tuechter, Cincinnati Bickford Tool Co. The new board organized by electing James E. Gleason, Gleason Works, president; Philip E. Bliss, Warner & Swasey Co., 1st vice-president; Wilson P. Hunt, Moline Tool Co., 2nd vice-president; and E. A. Muller, King Machine Tool Co., treasurer.

James E. Gleason

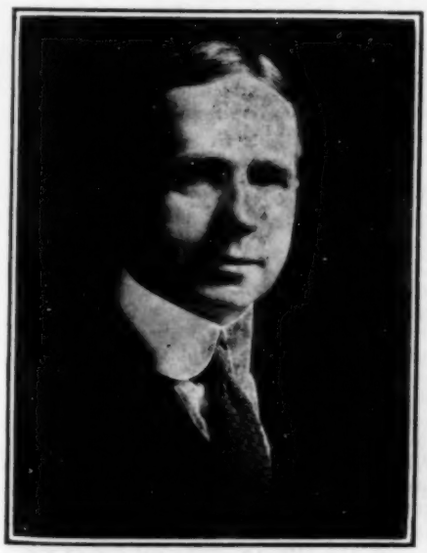
The report of the general manager, Ernest F. DuBrul, outlined the encouraging progress made by the standardization committee. The Tee-slot project is practically complete and a good start has been made on tool holders and tool post openings, milling cutters, spindle noses, and machine tapers. A new job just started is the standardization of speeds for constant-speed drives as recommended by Mr. Gleason in his address before the Providence meeting last spring.

Size and rating standardization of far-reaching effect was initiated by the lathe committee. Some progress along this line has already been made by the radial drill committee.

Speaking of business conditions, Mr. DuBrul said:

"Since our last convention, indexes of activity of most industries have continued on a very satisfactory level, and our own index of orders has conformed to this common experience. In this period, many industries have shipped more product than ever shipped before in the same length of time, and the country has been wonderfully prosperous for which all business men have been thankful.

"Early in this year, conditions were apparently shaping very strongly for a boom, which would of course have been followed by a recession. Many business forecasters assumed that most business men would lose their caution this year, as they had in past years



Henry Buker

Charles C. Swift

August H. Teuchter

under similar conditions. But this year business men heeded the forecasters' storm signals to such an extent as to nullify the forecasts in great measure. So far as the forecasters produced a cautious state of mind in business men, they did a very great service to business. Sane management simply did not allow business to go into an insane boom, as might easily have been the case in times gone by.

"No one need now be classed as a pessimist for believing that a high rate of activity is not likely to be maintained indefinitely. Some change in condition will take place some time, and it is well to be prepared to recognize that change whenever it does come. There is nothing but our own index of orders to show what is really happening in the machine tool industry. Reports of activity in other industries are of little value to the machine tool builder under conditions similar to the present.

"In early 1920, the air was full of the most optimistic reports from all sorts of industries, but if this industry had had our present index of machine tool orders, this index would have told the real story. So in view of that period's harsh experience, the industry should not fail to continue monthly reports, which, alone, tell whether the machine tool business is moving up or down or sideways. The present generation of management should carry on this certain record for the benefit of the generation of management just now coming on. Only such a record will furnish the fact basis for lessons that the present generation learned at great cost as recently as only five years ago.

"Are business fluctuations becoming less violent? It seems to be reasonable to answer this question in the affirmative. Violent fluctuations of the past have been due largely to the lack of reliable information on which to base sane judgment. Business executives were compelled to plan production, sales and finance on very unsound bases of sentiment, impression, emotion or hunch. The depression of '21 set many thoughtful business executives to studying these illogical, unnecessary and wasteful fluctuations. These men recognized that reliable information furnished a better basis for judgment than they had before. So more information was made available, and the facts disclosed were studied more closely. Large business concerns added departments of business analysis to their staffs. In the last five years, studious managers have planned their business courses along the lines that their economic advisers pointed out to be desirable. It seems fair to conclude that this planning must have been an important cause in producing the greater stability that business has had in the last three years.

"Inventory turnover has a large influence on profits. To keep the rate of turnover at a good, high average, the inventory must be reduced as demand falls off. Simplified designs and better control of inventory have improved the rate of turnover in many of our members' plants.

"More stable demand requires modification of managerial policy. It seems fair to assume that serious study of these facts by large machine tool users has led to a more stable policy in their placing of machine tool orders. Stabilization of orders changes the conditions to which managerial policy must be adjusted, and management necessarily meets problems of a different kind from those that were met when demand fluctuated more widely and in an uncontrolled manner.

"One such problem is the problem of plant capacity. If orders are to be better distributed by our customers in the future than they have been in the past, our industry will not need to maintain the peak load plants that were necessary in the past. With a more stable demand, a smaller plant will serve to produce just as many units as were produced in the same period in a larger peak load plant, and of course the cost per unit will be less for plant charges and many other costs that were involved in supplying a more fluctuationg demand.

"But unless we know whether demand is more stable or not, we can not set up the problems to be studied. The only way that we shall know, is by having a record from our own industry that will tell us the actual facts. We hope to secure this record of capacity in a way that will help each member of the Association."

The only outside speaker at the meeting was Prof. Joseph W. Roe, of New York University, who explained the plans for the establishment in New York City of a Museum of the Peaceful Arts under the terms of the Towne bequest. Prof. Roe explained that there is no conflict between the plans for this museum and those for the national museum in Washington or the industrial museum in Chicago for which money has been given by Mr. Rosenwald. The details of Prof. Roe's plans were published on p. 889, Vol. 64, of the *American Machinist*.

During the meeting two mornings were devoted to a golf tournament which was highly successful. On the second morning the non-golfers went to Pittsfield as guests of the General Electric Co. and witnessed an impressive demonstration of "artificial lightning."

Manufacturers Discuss Merchant Marine Immigration and the Open Shop

Use of waterways urged at annual meeting

While many phases of the nation's business were discussed at the thirty-first annual meeting of the National Asociation of Manufacturers, the merchant marine, immigration, transport by water and air, women in industry, trade with Russia and industrial preparedness were the main topics of interest. The usual invocation and the address of welcome by the mayor, were followed by reports of various committees, of the treasurer and of the secretary, after which Rear-Admiral Chas. P. Plunkett spoke on the necessity of a merchant marine of sufficient capacity to carry at least half the exports and imports of the country. Unless this is done he fears it will prove a great handicap to export trade. He believes that industrial leaders will solve the problem.

S. P. Bush, chairman of the Association's committee on transportation, gave some illuminating figures regarding the comparative earnings of water and rail transport companies. The inland waterways are stated to be earning between 30 and 40 per cent dividends while few railroads are earning a fair return on their capitalization. He also discussed the merits of the proposed St. Lawrence deep waterway and its probable effect on the railways with which it would compete.

The Hon. John H. Small, former chairman of the Congressional Rivers and Harbors Committee, told the meeting that transportation by water was necessary to reduce the rates now paid by shippers for moving their product. He advocated that railways be permitted to earn a reasonable dividend though believing that public regulation was necessary for public carriers. The use of motor trucks on highways was also discussed. The review of waterway transport was confined to inland and coastwise traffic, particularly those that interest two or more states and so come under national jurisdiction. Last year these waterways carried 453,700,000 tons of merchandise, valued at over $22,000,000,000. There are under improvement 109 harbors, 284 rivers and 53 canals and other waterways.

A novel and interesting feature of the first session was a greeting from some of the "Old Guard" who have been members of the Association since its organization in 1895.

The report of the Committee on Immigration, of which C. S. Ching is chairman, expressed doubt as to the efficacy of the new immigration quota based on the "national origin test" that becomes effective next year. It brought out that racial origin is frequently extremely difficult to determine owing to constant intermarriage. The report advocated registration of aliens. Following this, Hon. H. E. Hull, U. S. Commissioner-General of Immigration, told of the work of his department and what had been accomplished in reducing the smuggling of aliens into the country. He also advocated registration of aliens and feels that the restrictions in force regarding countries across the seas should apply equally to the countries that adjoin our own. While the present law is fairly satisfactory as a whole he feels that a few minor modifications would not materially affect the total number admitted and would eliminate some of the

rulings that now make it necessary to separate families.

Hon. Wm. P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronautics, gave an outline of the policy of his department concerning commercial aviation, which is greatly increasing its economic service. Aviation provides the speediest means yet devised for transporting passengers and merchandise. Air mail schedules are based on a speed of between 90 and 100 miles per hour which is more than three times the *average* speed of mail trains. And this speed will probably be increased at least 25 per cent in the next few years.

As to safety, the air mail flew two and a half million miles, half of this at night, and much of it over bad flying country, with but two fatalities. While commercial air lines are desirable to reinforce military activities in case of war, they also have a distinct commercial advantage and a few are already beginning to show probabilities of dividends in the near future.

Address of President

The annual address of President John E. Edgerton pointed out the achievements of the association as it has affected the organization of American industry. Saying that "to retain and to add to our present prosperity and the happiness of all our people, is our immediate objective," he pledged the association to the service of the whole nation.

Mr. Edgerton outlined the development of manufacturing of various kinds; the growth of all industrial products; the wider distribution of ownership, including the participation of employees; the decrease in labor disputes due to the more prosperous condition and the growing recognition by both employer and worker, of their growing inter-dependence.

Soviet Russia

The discussion, "Is Soviet Russia Worth While?" brought out some interesting and enlightening facts. Isaac J. Sherman, director of the Amtorg Trading Corporation, pointed out the great increase in the grain, cotton, flax and sugar beet industries in the past few years. These increases vary from 25 to nearly 300 per cent, being largely due to the use of 35,000 tractors in the Soviet Union alone. In 1921 industrial production was but 15 per cent of the output in 1913, but in 1925 it had advanced to 82 per cent. The coal output has doubled in four years while pig iron has increased from 120 million to 1,549 million metric tons and steel from 192 million to 2,118 million tons. Oil exports in 1925 were 44 per cent greater than in 1913, while cotton goods production has increased 374 per cent since 1923.

Mr. Sherman stated that American capital in the form of loans was really financing European competitors by compelling the purchase of European products when they would prefer to buy direct form this country. In his opinion, this is a crucial period as each order placed now means more orders from the same markets in years to come. Hugh L. Cooper, a consulting engineer, who has just returned from examining a 60 million dollar hydropower project for the Soviet Government, said that the whole trouble at present was founded on American ignorance of conditions in Russia. Dr. H. P. Willis, professor of banking at Columbia University, believes that the Russian trade field holds a promise that cannot be neglected by American producers.

The "Open Shop" was the subject of a session which was addressed by Charles B. King, Dr. Geo. B. Cutten, John Henry Hammond, John Lester Dryden and the Rev. John L. Belford, D.D.

The banquet was presided over by Wm. McCarroll, Dean of the Association's board of directors. The speaker of the evening was Hon. Finis J. Garrett of Tennessee, who claimed that the reported economies in government were not borne out by facts.

Education and employment of juniors was discussed by Howell Cheney, while O. D. Frost presented the report of the Employment Relations Committee and Calvett Townley the report of the Committee on Patents and Trade Marks. The first report dealt with the cost of strikes, causes of disputes, reduction of labor turnover, industrial leadership and increase of output per worker, while the latter committee report contained a plea for higher salaries for U. S. district judges.

Business conditions in the United States were outlined by D. M. Edwards and E. J. Prindle spoke for the increase in salaries of judges suggested by the committee. James A. Emery outlined the next step in tax relief.

There were two lunches held simultaneously on the 7th. The other on Industrial Preparedness. Prominent business women addressed the former which was, for the Women's Bureau, while the speakers at the latter were Gen. C. C. Williams, Chief of Ordinance, Hanford MacNider and Col. James L. Walsh. Gen. Williams spoke of the need for co-operation between industry and the army. This was seconded by Col. Walsh who has had much to do with the industrial preparedness program. The assistant secretary of war, Hanford MacNider, covered the question of preparedness in a general way. Describing the program for preparedness in industry, Mr. MacNider said:

The Munitions Battalion

"This coming spring we shall enlist into the regular "War Department Business Army" four hundred undergraduates chosen by college authorities to meet certain definite standards.

"They will be enlisted at the end of their junior year in college and promptly incorporated into a 'Munitions Battalion.' Their station will be near Washington and they will spend the summer in an intensive course in soldiering that will last until their schools reopen in the fall. They will then go back to finish their last year in college and to get their degrees. They will receive their tuition and the regular allowance of enlisted men, but free from military duty throughout the school year.

"After graduation the battalion will form again. During this period they will study for three or four hours a day, the basic procurement problems of the army. They will go forth just before Christmas to take their place in industry. We believe they will be an asset to industry and that they will end up as men tremendously more valuable to the nation, potential officers, alive to our problems, and an important addition to the National Defense."

Election of Officers

John E. Edgerton was re-elected president for the fifth consecutive year. Henry Abbott, of the Calculagraph Co. of New York, was re-elected treasurer.

Vice-presidents and directors were elected as follows:

Clifford S. Anderson, Norton Co., Worcester, Mass.; H. C. Atkins, E. C. Atkins & Co., Indianapolis; William H. Barr, William H. Barr, Inc., Buffalo; Hays H. Clemens, Hays Manufacturing Co., Erie, Pa.; Henry W. Cook, A. E. Nettleton Co., Syracuse; H. I. Finch, Emerson Electric Manufacturing Co., St. Louis; Philip O. Geier, Cincinnati Milling Machine Co.; W. H. Hager, American Car and Foundry Co., New York City; E. J. Harvey, Harvey Spring Forging Co., Racine, Wis., and E. M. Herr, Westinghouse Electric Co., New York City.

J. L. Kimbough, Indiana Bridge Co., Munice, Ind.; Charles B. King, Marion Steam Shovel Co., Marion, Ohio; Robert P. Lamont, American Steel Foundries Co., Chicago; E. B. Leigh, Chicago Railway Equipment Co.; George L. Markland, Philadelphia Gear Co.; I. B. Merriam, Chattanooga Boiler and Tank Co.; J. R. Millar, California Cotton Mills, Oakland, Calif.; A. H. Mulliken, Pettibone-Mulliken Co., Chicago; Charles B. Sligh, Sligh Furniture Co., Grand Rapids; E. E. Straus, Courier-Journal Job Printing Co., Louisville; John Trix, American Injector Co., Detroit; Frank B. Valentine, M. D. Valentine & Brother Co., Woodbridge, N. J.; C. S. Walker, Kratzer Carriage Co., Des Moines; William J. Wall, Nicetown Dye Works, Inc., Philadelphia; C. E. Whitney, Whitney Manufacturing Co., Hartford, Conn., and George H. Wilson, U. S. Bobbin and Shuttle Co., Providence.

Vice-presidents who are not directors were elected as follows:

G. L. Curtis, Curtis Companies, Inc., Clinton, Iowa; Richard H. Edmonds, *Manufacturers' Record*, Baltimore, and Hugh Morrow, Sloss-Sheffield Steel and Iron Co., Birmingham, Ala.

Assistant to president, J. Lewis Benton, New York City; secretary, George S. Boudinot, New York City; general counsel, James A. Emery, Washington, and associate counsel, Nathan B. Williams, Washington.

More than six hundred delegates registered for the convention.

A demonstration of the inter-relationship of the peace-time industries and national preparedness was given at the Aberdeen Proving Grounds on Oct. 8 for the mutual benefit of the National Manufacturers' Association and the Army Ordnance Association. An account of this visit is given on p. 658f of this issue.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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IT IS the fashion to ascribe the decline in securities to the decline in cotton and the impairment of Southern purchasing power that it will cause.

There is logic in this ascription, for even though cotton may rally it seems improbable that the Southern farmers can recover the cost of producing this year's crop. Some of them may be able to hold. They are being wisely encouraged to pursue this policy, but most of them will have to sell and the best that can be hoped for is that they will reduce their losses to a minimum by deliberation in marketing the product of their toil.

The action of the market on the Government estimate of Friday encourages the belief that this policy will be followed. The forecast of 16,627,000 bales was much above what was generally expected, but at a decline of about half a cent the offerings were relatively small and hardly equal to the demand.

But it would not be fair to hold cotton exclusively responsible for the decline in the stock market. It has been for some time evident that most securities were selling at or above their intrinsic value and that a reaction would come whenever anything happened to change speculative sentiment.

For this reason the writer has advised caution for some weeks past and is still disposed to counsel circumspection in buying speculative securities. They may ultimately be worth more than they are now selling for, but Rome was not built in a day and it takes a long time to convince bona fide investors that an appreciation of 50 or 100 per cent will be sustained, for they know that in the process of digestion some speculative regurgitation is almost certain to occur. Therefore it will be well to watch the total of brokers' loans as now reported by the Stock Exchange from month to month. On September 30th they had risen to $3,218,000,000 as compared with a previous peak of $3,536,000,000 reached last February, when the market commenced a decline which ended about the end of May, by which time they had been reduced to $2,767,000,000.

Perhaps it should be explained that the correspondence between these figures and the trend of the market is due to the fact that the total of brokers' loans is a rough guide to the volume of securities that are being carried on margin because they have been bought for resale rather than for permanent investment.

Distributive trade has not been much affected thus far. The demand for both cotton and woolen textiles has been well sustained. The steel industry has been described as "cheerful but not spectacular." Copper has, however, declined slightly and most other raw products show a sagging tendency.

Coffee continues to slip a little lower each day. Sugar is a shade easier. Rubber has been quiet and the grain markets have fluctuated within narraw limits. The volume of business in this country is at all times enormous and there is nothing that foreshadows an immediate contraction or depression. But it is plain, nevertheless, that there is less enthusiasm in some quarters and the prospect is for a boomless winter. In Florida the ravages of the storm are being repaired, but the speculation in land shows no signs of reviving. The land booms that were started on Long Island and elsewhere also seem to be petering out.

Construction Work Is Less

The F. W. Dodge Co. says that September construction in 37 states was only 1 per cent under last year, but a decrease of 9 per cent in "contemplated new work" is admitted. Automobile production for October is estimated at 400,000 cars against 450,000 last year. The chain stores and mail order houses continue to report increased sales, but the small independents are not so cheerful.

Call money on the New York Stock Exchange is a shade easier, but interest rates elsewhere in the United States are well maintained and it is believed that the Federal Reserve Banks stand ready to raise their rediscount rates upon the slightest provocation. Taking it all in all there is no reason to expect either a hectic revival of activity or an acute reaction, but there is an inclination to pause. It has been increased by the decline in cotton and it might become more marked if the complexion of Congress should be radically changed by the November elections. Wise business men will therefore look before they leap and try not to leap too far in any event.

The news from abroad is cheerful except for the interminable coal strike in England and the internecine war that seems to be spreading in China. Cables from France encourage the hope that Poincare may be able to stabilize the franc. But the Europe that was so near to us during the war is farther away now and we are comparatively immune to the social and financial ailments by which so many of the nations overseas appear to be vexed in their struggles to get back on their feet.

What's Doing in Industry

Reviewing the reports which have been received from various sections of the country, the immediate impression must be that the machinery industry is considerably more active than in September and the forecasts are unanimous in the opinion that it will continue to be so through the rest of the year.

Railroads at some points were active, while at other points they were expected to place orders in the near future. Some of the automotive manufacturers have placed large orders for new equipment and for replacement tools. Particularly encouraging, however, is the fact that industrials continue to remain the backbone of the purchasing list, as a whole.

The revival of buying and the increase in the number of inquiries received this week is viewed with enthusiasm and taken as indicating that the peak of the fall business will not be reached until late in November at the earliest. True to expectations, the National Steel and Machine Tool Exposition has helped to stimulate activity, especially in the Chicago territory where even the used machinery trade has been boosted by it.

It is agreed quite generally that the amount of business for the past quarter is at least 15 to 20 per cent above the corresponding period for a year ago.

The Industrial Review

Progress of the machinery and machine tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

New England

Operations in the leading machinery building plants in the New England territory, especially throughout Connecticut, continue active. Nowhere is there any indication of slowing up of operations and poduction schedules are not being curtailed. The consensus of opinion among heads of companies is that there will be little if any cessation even towards the end of the year.

The third quarter being ended the results of the quarter are being studied and by many of the companies earnings are found to be running ahead of the previous quarters of the year. The results are held by the trade to be very satisfactory.

Buying during the past week has been very general and the orders have been for a wide diversity of equipment. The St. Louis and middle-western sections are well represented in the lists of business placed. A fair sprinkling of buying for South American countries is reported.

New York

The New York industrial market seemed to pick up considerably during the past week. Manufacturers and dealers were unanimous in the opinion that inquiries were more frequent and orders being placed in greater numbers than at any time in September. The increase in amount of business is considered as indicative that October and November will show up substantially better, August and September having suffered a decrease which has scarcely been recovered.

Railroads placed several orders with companies in the territory and a few automotive orders were placed The principal business was in the industrial division. The sales for the week included two car-wheel lathes, a car-wheel borer, and a 10-ft. pneumatic flanging clamp. In addition, the list of machines sold included a 30-in. profiling machine, a heavy multi-cut lathe, two 5-ft. radial drills, a 24-in. geared-head lathe, a 36-in. gear-hobbing machine, a 7-ft. heavy boring mill, a 48-in. x 10-ft. planer, seven 3-ft. radial drills, three 16-in. geared-head lathes, a jig boring machine, four bench milling machines, two 8-in. automatic milling machines, a 4½ x 12-in. thread miller, a cylindrical grinder and a 10-ft. press brake.

The size of this list which is only a representative one, indicates, by comparison, a considerably renewed activity in the market. The prospects continue to be bright.

Detroit

Unless there is a very noticeable slump in the machine tool and machinery field in Detroit and other automotive centers of southeastern Michigan, this fall will prove to be a very good period for all manufacturers' representatives. The steadiness of the market conditions gives local salesmen a basis for believing that the year will be closed up with a very satisfactory record as a whole.

An increase in the number of inquiries has been noted, and sales seem to be more widespread. Not only are the automobile and accessory plants ordering machinery but other companies in the industrial field are buying some equipment. Detroit manufacturing in general is bearing out the statement that the country is enjoying prosperity.

As has been the case during the past few months the big General Motors plants are the heaviest buyers of tools and machines. The building program for the new Pontiac plant at Pontiac is moving forward rapidly. The Cadillac Motor Car Co. is ordering considerable new equipment. Chevrolet's expansion is as yet far from completed.

Machine tool men are watching with eagerness every move on the part of the Ford Motor Co., recently. The recent inauguration of the five-day week in the Ford plants at Highland Park and Fordson (formerly the River Rouge) plant may mean that Ford must buy considerable new equipment to handle production in the shorter week. Some purchases are being made at Ford's but nothing like what some machinery dealers expect. Demand is for standard equipment among the smaller shops and for special machinery in the larger factories. There is hardly a line of tools which is not moving to some extent in Detroit.

Milwaukee

The conservative view that business in metal working equipment will proceed along a line without sharp peaks or valleys for the remainder of the year seems to prevail among Milwaukee dealers and manufacturers. Considering all factors, trade is satisfactory and there appears to be nothing on the horizon to disturb the steady progress that has characterized the movement of business for the past twelve to eighteen months.

With the demand for automotive products during the first half of October maintaining a pace wholly unusual in its activity for the season, and the production of the large organizations still unable to fill the demands of the consumer, the tool trade is experiencing a call for equipment, which has upset every speculation as to the future requirements of this industry in recent months.

Business in the electrical industry, classified broadly, is reported to be averaging fully 15 per cent above a year ago. As in the case of virtually all other groups, save the automobile industry, manufacturers of electrical merchandise are making no conspicuous effort to provide for outstanding increases in capacity but even the conservative measures to keep abreast of the steady improvement of orders are helping to keep manufacturers of machine tools comfortably busy and able to look forward to the immediate future without misgivings.

Philadelphia

The outlook for business in the machinery and machine tool trade continued to be bright this week, and business has been tending to increase steadily.

Railroads along the eastern coast have been purchasers of chain blocks and overhead cranes during the last fortnight. There have been some orders also from middle-western lines. Machinery orders have come also from the steel and iron industries as well as from automobile manufacturers.

Inquiries continue from a well-scattered area as well as from diversified classes of manufacturers. Plants continue to operate at from sixty to seventy per cent of capacity.

Buffalo

The machinery business in Buffalo suffered somewhat during the month of September. While exact figures are not yet available, there were few who reported that their September business had maintained the pace set during the previous months of the year.

However, the early days of October have brought with them a renewed activity which indicates that this month will make up for the ground lost during September. Inquiries are coming in at an encouraging rate. There was, even in September, some increase in the demand for contractor's equipment to fill the needs of those who are preparing for winter construction.

Despite the poor or indifferently good September, those in the machinery equipment business are very optimistic concerning the next three months and believe that the year is to close with a good volume of business at the end. If there are any dull spots in Buffalo at the present time they are to be found in the industries related in some way to the railroads. The automotive field is particularly good.

Cincinnati

A further increase in sales during the past week is reported by machinery manufacturers and selling agents in the Cincinnati district. Several urgent orders were even received by telegraph and long-distance telephone.

The heaviest buying by a single source during the week, it is stated, was by concerns in the automotive industries. Orders from this source included several good-sized lists of machinery, as well as for an increased number of single tools and replacements. Railroads bought more than in the previous week and also sent in an increased number of inquiries.

At this time it seems that the October sales will be considerably larger than those during the previous month, and it is not thought that the peak will be reached until the end of November or even later. The increased number of inquiries coming in, together with the fact that many of them specifically request that a reply be sent quickly, is taken to indicate clearly that a greater and more urgent demand is about to come.

Cleveland

The first nine months of 1926 show a marked increase in the production and sale of machine tools and machinery over the corresponding period of 1925. The increase in the machine tool industry ranges from 15 to 30 per cent, according to information gathered from leading local manufacturers.

In general, every line of manufacture in this section has enjoyed quite a steady flow of business thus far this year. Orders, as well as inquiries, are still coming in, which fact points to a successful termination of the year.

The production of household electric appliances and electric motors shows an upward trend between 20 and 30 per cent, with a good steady market promised for the balance of 1926. The automotive lines, likewise, report a slight increase, but no definite figures are available at this time.

Chicago

A general improvement in the machine tool market is reported as having taken place within the last week. By some, this is attributed to the recent machine tool and steel exposition, but most dealers and manufacturers regard it as the start of an upward curve in the machinery industry which will probably continue until the holiday season.

Machinery men, without exception, concede that some stimulation has resulted from the exposition, and to that extent regard it as having been beneficial to their interests. While spot sales are not in excess of the average for this time of year, the inquiries being received are of a character that encourages optimism.

Railroads are deferring the placing of orders on lists that have been out for some time, but business from this source is expected to soon materialize. The automotive industry is coming into the market for needed equipment. This is particularly true in the case of manufacturers of automobile bodies, whose increasing activity is resulting in many substantial orders for woodworking machinery.

European Governments Will Co-operate with Tariff Commission

A better understanding of the flexible tariff is being reached by European governments and business men, and, in consequence, many of the obstructions formerly placed in the paths of agents of the United States Tariff Commission, in their efforts to get information in foreign countries, are being removed, according to Thomas O. Marvin, chairman of the commission, who has just returned from a tour of Europe.

The French and the Belgian governments have taken no official stand with regard to the work of the Tariff Commission but there have been no complaints regarding activities of the Commission's agents in more than a year. The official attitude of these two countries have been that they do not require their nationals to give them costs of production for any purpose and therefore they cannot ask that such costs be given to representatives of a foreign government.

In Germany, Mr. Marvin conferred with Dr. De Hasse, Commission of Industries, who gave assurances that he would inform manufacturers of that country that the German government believes it beneficial to co-operate with the Tariff Commission, since tariffs should be based on facts rather than theories. An understanding has been reached by the Italian government which is also co-operating with the Commission.

Army Ordnance Holds Demonstration at Aberdeen

More than two thousand members of the Army Ordnance Association, the National Association of Manufacturers, The American Society for Steel Treating, and the National Industrial Conference Board assembled at the Aberdeen Proving Ground, Md., on October 8, to witness the exhibits and demonstrations of ordnance equipment which accompanied the annual meeting of the Army Ordnance Association.

In making his announcement of the program of the day, Colonel C. M. Wesson, Commanding Officer of the Aberdeen Proving Ground, stated that the officials of the Ordnance Department welcomed the opportunity to show the manufacturers of the country what the Department is doing.

The first demonstrations of artillery material was the firing of a 16-in. gun on a sea-coast barbette carriage, and a 12-in. gun on a railway mount. The former is the largest gun ever built in the United States, and has a range of 30 miles. The railway gun has a range of 27,900 yds. with a 700-lb. projectile. These tests were followed by demonstration firings of various sizes of anti-aircraft guns against towed targets at an elevation of 3,000 ft.

Exhibitions were also given of the dropping of demolition bombs and smoke bombs from airplanes, the laying of a smoke screen, and the throwing of white phosphorus grenades.

The demonstrations of tank and tractor equipment included service trials of several models of tanks under firing conditions, and also the exhibition of the tractors and cross country cars manufactured by various automobile companies. The 5- and 10-ton caterpillar-type tractors have been adopted as the standard in the army for the draft of heavy artillery.

At the meeting of the Army Ordnance Association, to which the visiting members of the National Association of Manufacturers were invited to attend, the Hon. Benedict Crowell, who served as Assistant Secretary of War during the World War, was re-elected President of the Association. The Hon. Dwight F. Davis spoke of the excellent co-operation which the War Department has been receiving from civilian manufacturers, and expressed the hope that through these meetings and demonstrations the business men of the country would come to know better the problems confronting the army in seeking through industrial preparedness to avert the wastes and extravagances experienced in previous emergencies. Other speakers were Col. Hanford MacNider, Assistant Secretary of War, Maj. Gen. J. H. Hines, Chief of Staff, and Maj. Gen. M. B. Stewart, Commandant of the West Point Military Academy.

New High Record for Car Loadings

The greatest number of cars in the history of the railroads was loaded with revenue freight during the week ended on September 18, according to the report of the Car Service Division of the American Railway Association The total for the week was 1,187,011 cars, the largest number loaded for any week ever reported.

The total for the week of September 18 exceeded by 36,665 cars the previous record established the week ended on September 4 when 1,151,346 cars were loaded. It was also an increase of 62,573 cars over the highest week in 1925.

Army Air Stations to Aid Civilian Planes

Under the provisions of subsection B, section 5, Air Commerce Act of 1926, commanding officers of Army Air Corps stations are authorized to make emergency sales of aircraft fuel, oil, eqiupment and supplies, and in emergencies to furnish mechanical service, temporary shelter and other assistance, for cash payments, in order that aircraft may continue to the nearest airport operated by a private enterprise. Complete engines, airplane wings and other major items of equipment will not be sold.

Supplies sold and assistance furnished will be charged for at the fair market value prevailing locally. In cases where similar supplies are not available in nearby localities, supplies may be sold at cost price plus ten per cent. Mechanical service will be charged for on the same basis as the local rates for similar work. Where there are no local firms and the fair local price cannot be determined, such service will be charged for at the rate of $1.25 per hour for each mechanic. Shelter may be furnished when available, at the rate of $1 per day for single-engine airplanes, and $3 per day for multi-engine machines.

July Exports of Factory Equipment

Foreign trade statistics for the month of July, which have been issued by the Department of Commerce show a large volume of export shipments of factory supplies.

Hand or foot operated metal-working machinery and parts sold abroad during July reached a value of $18,766. The total for pneumatic portable tools was $98,665 and that for other portable metal-working machines was $35,745. The exports of diesel and semi-diesel reached a total of $227,914. Those of other stationary engines under 10 hp., amounted to $336,185, and those of stationary engines over 10 hp., amounted to $450,021, in value.

Mechanical Engineers Plan Student Branches

Student branches of the American Society of Mechanical Engineers are to be established at Princeton University, Princeton, N. J.,; the Mississippi Agricultural and Mechanical College and the Rose Polytechnic Institute at Terre Haute, Indiana.

This was authorized by the council of the society which recently concluded its annual convention at Richmond, Va.

Punch and Die Makers to Standardize Products

A group of representative manufacturers of punches and dies, meeting under the joint auspices of the National Committee on Metails Utilization and the Division of Simplified Practice of the Department of Commerce took initial steps recently toward the simplification of their products.

Those present at the meeting, which was presided over by Edwin W. Ely, were of the opinion that there was at present an over-diversity in the number of sizes and varieties of punches and dies, and that a reduced list would adequately serve all normal requirements. Further, the conference was of the opinion that the regular procedure of the Department of Commerce would be helpful in securing the essential support and co-operation of industry.

With a view to framing a tentative Simplified Practice Recommendation to be presented to a general conference of manufacturers, distributers and users at some future time, the following were appointed as a committee of the industry to make a survey of current practice, as a basis for a simplified list of sizes: H. C. Hungerford, chairman, Pratt & Whitney Co., Hartford, Conn.; Joseph Bischoff, Cleveland Punch and Shear Works Co., Cleveland, Ohio; C. W. Moreton, Consolidated Machine Tool Corporation of America, Wilmington, Del.; and F. E. Templeton, F. E. Templeton Manufacturing Co., Lancaster, Pennsylvania.

Business Items

The Johnson Manufacturing Co., Inc., has announced the consolidation of the Seattle Machine Works with the former company. The plants are located at Seattle, Wash.

The High Standard Manufacturing Co., New Haven, Conn., has been incorporated to manufacture tools and accessories. The incorporators are: C. G. Swebelius, Gustave A. Beck and Carl A. Beck.

The C. I. Packer Tool & Die Co., Inc., Meriden, Conn., has been incorporated to manufacture tools and machinery. The incorporators are: Sophy L. Collins, Clifford I. Packer and Willis D. Northrop.

The Bakstad Machinery Co., Elkhart, Ind., has been incorporated to build machinery, specializing in road-building equipment. The incorporators are M. M. Bakstad, W. McK. White and M. M. Bakstad.

The Vulcan Metals Process Corporation, Muncie, Ind., has been incorporated to deal in iron, steel and other metals. The incorporators are Lewellyn Jones, Walter L. Nelson, J. C. Harris and J. A. Mouch.

The Thomas & Skinner Steel Products Co., Indianapolis, Ind., has purchased the property formerly owned and operated by the Pioneer Brass Works in Indianapolis, and will remove to the new plant shortly.

The Wabash Tool & Die Works at Wabash, Ind., has purchased the factory and site of the United States Button Co., in Wabash, and will move to the new building shortly.

The Metal Trading Co., Indianapolis, Ind., has been incorporated for the purpose of dealing in metals and machinery. The incorporators are Frank J. Viehmann, Adolph Seidensticker and Frank Seidensticker.

The Sterling Stop Watch Co., recently incorporated in Waterbury, Conn., has organized with the following officers: president, Benjamin Webster; vice-president and secretary, Thomas Pastor; and treasurer, Fred Weber.

The Lamb Machine Co., Hoquiam, Wash., held an "open-house" engineering exposition at its plant on October 1. All departments were open for inspection while in operation. Employees of the company conducted the guests through the works.

The New England Steel Ball Corporation has been organized at Danbury, Conn., and will establish its plant at No. 43 Foster street. The officers and directors are: president, Charles G. Hoffman; vice-president, Melvin Robbins; secretary and treasurer, Charles A. Springstead; assistant secretary and treasurer, John A. Lyon; and J. Moss Ives.

Purdue University, Lafayette, Ind., will soon begin research work on brake systems for trains. Bids have been received for the construction of a special building to be used for air brake tests. Some months ago the railroad interests donated several thousand dollars to the university for carrying on the work to develop, if possible, a better brake system for trains.

The Youngstown Foundry & Machine Co., Youngstown, Ohio, has purchased the major part of the Oak St. foundry property of the United Engineering & Foundry Co., Pittsburgh, Pa. During the next six months, manufacturing operations of the Youngstown company will be transferred to the new location and capacity doubled. The present plant will be used for storage purposes and eventually sold.

The Wayne Tank & Pump Co., Fort Wayne, Ind., has changed its name to the Wayne Co. Permission for the change was granted by the Circuit Court in that city for the reason that the old name was no longer descriptive of the products made by the company. In addition to a line of gasoline pumps and tanks, the company manufactures oil burners, water softeners and other equipment.

At a special meeting of the stockholders of the Evansville, Indianapolis & Terre Haute Railway Co., held recently in Terre Haute, Ind., the lease of the railway property to the Big Four R.R., for a period of 999 years, was approved. Joseph M. O'Mahoney, assistant secretary of the New York Central lines attended the meeting in behalf of the New York Central. Each one of the 42,900 shares of stock in the E. I. & T. H. company was voted.

Rumors from New York to the effect that the Studebaker corporation is negotiating the sale of certain of its Detroit properties where it has offices and plants, are branded as false by A. R. Erskine, president of the corporation. "We have no intention of selling our Detroit properties," he declared. In fact we are increasing rather than decreasing our Detroit operations." Some of the officials and offices formerly located at Detroit are being moved to South Bend as announced last fall. The transfer of some of the men is being made this month, while the remainder will not be sent to South Bend until November.

The Auburn Automobile Co., Auburn, Ind., has purchased the entire plant, equipment and assets of the Duesenberg Motors Co., Indianapolis, Ind. The new company is to be known as Duesenberg, Inc., and will continue to manufacture the Duesenberg car. It is announced that the company is an entirely separate organization and will have no connection with the Auburn Automobile Co., nor will there be any intercompany relationship. Fred S. Duesenberg will continue in the organization as vice-president, in charge of engineering and experimental work. He will also retain a substantial interest in the new corporation.

The following changes in the executive offices of S. F. Bowser & Co., Fort Wayne, Ind., have been announced, following a meeting of the board of directors of the corporation. L. E. PORTER has been named vice-president in charge of industrial sales; T. D. KINGSLEY has been named vice-president, in charge of commercial sales; and D. C. MILLIGAN, vice-president in charge of foreign sales. Mr. Porter, before his appointment as vice-president, was treasurer of the company. Mr. Kingsley was assistant general manager, and Mr. Milligan was director of foreign sales. L. W. KOHLER will be sent to Fort Wayne from Philadelphia where he has been district manager of lubrication and filtration, to be manager of this same branch in Fort Wayne, succeeding C. H. Bromley. Other changes are: J. R. MATLACK, former assistant to the president, to become treasurer; C. H. BROMLEY to become assistant to the president in charge of sales research.

Obituaries

CHARLES O. DOBBINS, president of the Dobbins Manufacturing Co., Indianapolis, Ind., died at his home, October 1. Mr. Dobbins came to Indianapolis in 1916. The funeral services were held at the home of his mother in Bloomington, Ind.

WILLIAM H. THORNLEY, manufacturer and attorney, Providence, R. I., died October 5 at his home in that city. Mr. Thornley was born in Halifax, Pa., in 1869, and finished his education at Brown University in Providence.

For many years he was an official of the Tubular Woven Fabric Co., and was later connected with the Lisk Manufacturing Co., of New York. He was also a director of the Narragansett Machine Co., Pawtucket, R. I., and was a director of the National Bank of Commerce, Providence.

He was a member of many clubs, including the University Club, the Squantum Club, and the Wannamoisett Club. He was a member of the Masons, and several college fraternities.

WILLIAM J. WATSON, organizer of the Buda Foundry & Manufacturing Co., the Hewitt Manufacturing Co., and the Fort Madison Iron Works, died in Chicago recently at the age of 83. Mr. Watson came to Chicago from St. Louis in 1873 as the representative of the Middleton Car Spring Co., of which he became president in 1890. Of recent years he devoted much of his time to banking interests, being at the time of his death a director in several large banking institutions.

JAMES J. PEARSON, retired mechanical engineer, dropped dead recently, at his home in San Francisco. He was assistant minister of munitions for Great Britain during the late war. He was 72 years old and a native of Dumfriesshire, Scotland. He came to this country thirty-six years ago, after superintending the construction of the navy yards in Japan. In New York he was the consulting engineer for the International Mercantile Marine. Six years ago he came to San Francisco to retire. He was a member of the Royal Societies Club of London, the Engineers' Club and the National Arts Club, of New York, and the Manhattan Masonic Lodge.

Personals

JAMES T. DENTON, president of the Turner Machine Co., Danbury, Conn., has returned from a two month's vacation in England.

W. J. ULRICH has been appointed district sales manager of the coated abrasive sales division in the Detroit territory. He was previously district sales manager for the Manning Abrasive Co., in the Detroit territory.

E. H. GUNTHER, who has had charge of sales promotion for the Auburn Automobile Co., Auburn, Ind., has resigned and will move to Fort Wayne, Ind., where he will engage in the practice of law and will also be a member of the faculty of the Anthony Wayne Institute.

Forthcoming Meetings

American Gear Manufacturers Association. Semi-annual meeting, Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 14, 15 and 16. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Iron and Steel Institute. Fall meeting, Hotel Commodore New York, Oct. 22. E. A. S. Clarke, secretary, 40 Rector St., New York City.

Management Week. National observance, Oct. 25 to 30. General theme—"Progress in Waste Elimination." Organizations cooperating are the American Society of Mechanical Engineers, American Management Association, American Institute of Accountants, Society of Industrial Engineers and the Taylor Society.

National Safety Council. Fifteenth annual safety congress, Detroit, Mich., Oct. 25 to 29. A. A. Mowbray, director, 108 East Ohio St., Chicago.

American Welding Society. Eighth annual fall meeting, in conjunction with International Welding and Cutting Exposition, Broadway Auditorium, Buffalo, N. Y., Nov. 16 to 19. Secretary's headquarters, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Fifth event, Grand Central Palace, New York City, Dec. 6 to 11. I. E. Moultrop, chairman advisory committee, Edison Electric Illuminating Co., Boston, Mass.

National Founders Association. Thirtieth annual convention, Hotel Astor, New York, Nov. 17 and 18. J. M. Taylor, secretary, 29 South La Salle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 6 to 9. Details later. Calvin Rice, secretary, 29 West 39th St., New York.

American Association for the Advancement of Science. Annual meeting, University of Pennsylvania, Philadelphia, Pa., Dec. 27 to Jan. 1. Sam Woodley, executive assistant, Smithsonian Institution, Washington, D. C.

Society of Automotive Engineers. Annual meeting, Detroit, Jan. 25 to Jan. 28. W. Delchamps, chairman, meetings and sections departmment, 29 West 39th St., New York.

The Weekly Price Guide

Rise and Fall of the Market

PRICES of shop materials and supplies show few indications of change in the immediate future. The three great groups to which most of the items listed belong are iron, steel and non-ferrous metals. Pig-iron prices are rising, at least in this section of the country. Whenever domestic iron goes up $1 per ton or even less, foreign material immediately checks possibilities of a protracted rise. Steel is steady and the non-ferrous metals s'ow, at this particular time. With no marked price fluctuations occurring in the main materials, either raw or fabricated, it developes that the fourth group, consisting of non-metallic supplies, shows advances and declines about evenly balanced.

(All prices as of Oct. 8)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.19
Northern Basic	20.39
Southern Ohio No. 2	21.39
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	20.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	28.67
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.75
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.05
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	19.76
Basic	19.76
Bessemer	19.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00@5.25
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.30@2.40	3.50	3.15	3.89
No. 12	2.35@2.45	3.55	3.20	3.94
No. 14	2.40@2.50	3.60	3.25	3.99
No. 16	2.50@2.60	3.70	3.35	4.09
Black				
Nos. 18 to 20	2.80@3.00	3.75	3.50	4.15
No. 22	2.95@3.15	3.90	3.65	4.30
No. 24	3.00@3.20	3.95	3.70	4.35
No. 26	3.10@3.30	4.05	3.80	4.45
No. 28	3.25@3.45	4.20	3.95	4.60
Galvanized				
No. 10	3.15@3.25	4.10	3.85	4.40
Nos. 12 to 14	3.25@3.35	4.20	3.95	4.50
No. 16	3.35@3.45	4.30	4.05	4.60
No. 18	3.50@3.60	4.45	4.20	4.75
No. 20	3.65@3.75	4.60	4.35	4.90
No. 22	3.70@3.80	4.65	4.40	4.95
No. 24	3.85@3.95	4.80	4.55	5.10
No. 26	4.10@4.20	5.05	4.80	5.35
No. 28	4.35@4.45	5.30	5.05	5.60

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

— Thickness — B.W.G. and Decimal	Fractions	Outside Diameter in Inches ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	7.00	6.00@7.50	4.65†
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛, 8.35c.; ⅛, 7.85c.; ⅛ to ½, 7.35c. per lb. *Flat, 1/16@½-in. thick. †F.o.b. cars.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			73.37½
Lead (up to carlots) E. St. Louis	8.25	New York	9.12½
Zinc (up to carlots) E. St. Louis	7.30	New York	8.25

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot.	17.00	20.50	15.00
Copper sheets, base	23.00	23.00	23.00
Copper wire, base	20.00	20.00	20.00
Copper bars, base	22.62½	22.62½	22.50
Copper tubing, base	25.00	25.00	25.00
Brass sheets, base	19.37½	19.37½	19.37½
Brass tubing, base	24.25	24.25	23.75
Brass rods, base	17.12½	17.12½	17.12½
Brass wire, base	19.87½	19.62½	19.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	27.00	27.00	27.02
Zinc sheets (casks)	13.25	13.05	12.01
Solder (½ and ½), (case lots)	42.87½	44.00	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			88.00
Commercial genuine, intermediate grade			61.00
Anti-friction metal, general service			32.50
No. 4 babbitt (f.o.b.)			14.75
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00 Electrolytic 39.00 Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	12.25 @12.50	11.50	11.25@11.75
Copper, heavy, and wire	11.50 @12.00	11.75	10.50@11.00
Copper, light, and bottoms	10.00 @10.25	10.00	9.50@10.00
Heavy lead	7.37½@ 7.62½	7.25	6.75@ 7.25
Tea lead	5.50 @ 5.75	5.25	5.75@ 6.25
Brass, heavy, yellow	7.00 @ 7.25	7.50	7.00@ 7.50
Brass, heavy, red	9.25 @ 9.50	9.75	9.00@ 9.50
Brass, light	6.00 @ 6.25	6.50	6.25@ 6.75
No. 1 yellow rod turnings	8.00 @ 8.25	8.25	7.50@ 8.00
Zinc	4.25 @ 4.75	4.50	4.00@ 4.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13@0.17½	$0.18	$0.15@0.20
Cotton waste, colored, per lb.	.10@ .14	.14	.12@ .17
Wiping cloths, washed white, per lb	.17½	36.00 per M	.15
Sal soda, per 100 lb. keg	2.05	2.25	2.75*
Roll sulphur, per 100 lb	2.70†	3.50	4.25‡
Linseed oil, per gal., 5 bbl. lots	.85½	.98	88
Lard cutting oil, 25% lard, per gal.	.55	.50	.48
Machine lubricant, medium-bodied (55 gal. metal bbl.), per gal.	.35	35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*Per 175 lb. keg. †In 150-lb. bags. ‡Per 425 lb. barrel.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.0415
Brass rods	per lb.	.1712½	.1712½	.1687½
Solder (½ and ½)	per lb.	.4287½	.4112½	.395
Cotton waste	per lb.	.13@.17½	.13@.17½	15@22
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	7.00
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.35
Belting, leather, medium	off list	40–5%	40–5%	40%
Machine bolts, up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.40	$5.84	$5.65
Emery paper	10.71	11.00	10.71
Emery cloth	27.84	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.45	1.49
Cloth	3.10	3.50	3.75
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton		3.50@ 3.75
Coke, prompt foundry, Connellsville	per net ton		4.25@ 5.00
White lead, dry or in oil	100 lb. kegs	New York, 15.25	
Red lead, dry	100 lb. kegs	New York, 15.25	
Red lead, in oil	100 lb. kegs	New York, 16 75	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1½ and 1½x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ½x½-in., 2c. each. Discount 70% for $\frac{5}{16}$-in and smaller and 65% for ⅜-in. and larger.
Case hardened ½x½-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{1}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb. 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅝-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Me., Guilford—Hardwood Products Co.—milling machine.

Mass., Boston—Bureau of Supplies & Accounts, Navy Dept., Washington, D. C.—will receive bids until Oct. 19 for electric drills, grinders and iron or steel welding wire for Navy Yard here.

Mass., Roxbury (Boston P. O.)—V. Rugo, 8 Willow St.—miscellaneous tools and equipment for extensive repair and service garage.

Mich., Detroit—Detroit City Gas Co., Clifford St.—machinery and equipment for proposed 1 and 2 story, 50 x 116 and 58 x 131 ft. garage and service station. Estimated cost $150,000.

Mich., Detroit—National Smelting & Refining Co., 1843 Livernois Ave.—complete equipment (later) for proposed 1 story, 60 x 200 and 70 x 150 ft. foundry on Jefferson Ave. Estimated cost $100,000.

N. Y., Brooklyn—Mutual Electric Hardware Mfg. Co., 28 Verandah Pl.—Universal milling machine, shaper, power press, and lathe.

N. Y., Long Island City—Cornell Iron Works, 36 13th St.—18 in. turret lathe.

O., Cleveland—Frankelite Co., 5016 Woodland Ave., D. Frankel, Pres. (lighting fixtures)—spraying and plating machinery (about Jan. 1.)

O., Cleveland—Willard Storage Battery Co, 246 East 13t St., P. H. Voth—special machinery for manufacture of new storage batteries (after Jan. 1.)

O., Columbus—Bobb Chevolet Co., 990 Parsons Ave., W. Stauffer, Service Mgr.—24 in. lathe, drill press, burning machine, 3 valve grinders, etc. for proposed 114 x 202 ft. service station.

Pa., Franklin—Chicago Pneumatic Tool Co.—drill press, milling machine and 15 ton overhead electric crane.

Pa., Johnstown—Bethlehem Steel Co.—2 ladle cranes.

Pa., Pittsburgh—National Tube Co., Frick Bldg.—soaking pit crane and 75 ton trolley.

Wis., Milwaukee—American Electric Motors Inc., 57 Erie St., P. E. Keller, Purch. Agt.—drill press, lathe, and buffers.

Wis., Milwaukee—Edwards Motor Co., 3601 Grand Ave.—machinery and equipment for proposed 1 story, 150 x 150 and 100 x 106 ft. addition to repair and service garage. Estimated cost $100,000.

Wis., Wauwatosa—E. Gissinger, State St. (sheet metal works)—10 ft. brake.

Ont., Hamilton—Wentworth Auto Supply Co., John St. N., H. Slack, Prop.—radio and auto parts equipment for proposed new factory. Estimated cost $75,000.

Que., Montreal—J. A. Paiement, 2361 Gouin Blvd. W.—complete machinery and equipment for public garage at 1400 St. Lawrence Rd.

Opportunities for Future Business

Calif., Richmond—Ford Motor Car Co., Highland Park, Mich., plans the construction of an assembling plant here. Estimated cost to exceed $650,000.

Conn., New Britain—Goss & DeLeeuw Machine Co., has work under way on a 1 story, 60 x 125 ft. extension to plant.

Conn., Stratford—Eagle Construction Co., 80 Bishop Ave., Bridgeport, had plans prepared for the construction of a plant for the manufacture of metal portable buildings. Estimated cost $50,000. Private plans.

Conn., Torrington—Torrington Specialty Co., Inc., Winsted Rd., awarded contract for the construction of a 1 story addition to plant. Estimated cost $40,000.

Ill., Chicago—International Harvester Co., 606 South Michigan Ave., plans the construction of a 1 story, 44 x 53 ft. addition to plant at 2600 West 31st St. Estimated cost $30,000. J. J. Davey, 431 South Dearborn St., Archt.

Ill., Chicago—The Walworth Co., H. Coonley, Pres., 2436 West 15th St., awarded contract for the construction of a 1 story, 50 x 60 ft. machine shop.

Ind., Bloomington—Curry-Buick Co., awarded contract for the construction of a 2 story, 72 x 131 ft. repair and machine shop. Estimated cost $65,000.

Ind., Indianapolis—Reliance Specialty Co., 2229 Massachusetts Ave., manufacturers of metal novelties, awarded contract for the construction of a 40 x 165 ft. factory. Estimated cost $40,000.

Mass., Boston—H. E. Cline, 43 Tremont St., will build a 1 and 2 story, 95 x 240 ft. repair and service garage at Chelsea and Henley Sts. Estimated cost $80,000. Private plans.

Mass., Brighton (Boston P. O.)—Commercial buildings Corp., R. A. Nordbloom, 79 Milk St., Boston, awarded contract for the construction of a 1 story repair and service garage at 235 North Beacon St. here. Estimated cost $40,000.

Mass., Brighton (Boston P. O.)—Sanford Motor Truck Co., 916 Commonwealth St., Boston, awarded contract for the construction of a repair and service garage on North Beacon St. here. Estimated cost $40,000.

Mass., Cambridge (Boston P. O.)—Houghton & Dutton Co., 55 Tremont St., Boston, awarded contract for the construction of a 1 story addition to garage and repair shop on Main St., here. Estimated cost $40,000. Noted Apr. 1.

Mass., Lawrence—J. W. Bolton & Son Inc., 9 Osgood St., manufacturers of machine knives, pulp and paper mill machinery, etc., is receiving bids for the construction of a 2 story addition to factory at Osgood and Market Sts. Estimated cost $40,000. Ashton, Huntress & Aiter, 477 Essex St., Archts.

Mass., Malden (Boston P. O.)—L. M. Fowler, 424 Pleasant St., is receiving bids for the construction of a 1 story, 65 x 85 ft. garage and repair shop. Estimated cost $40,000. A. O. Bottomley, 10 Tremont St., Boston, Archt.

Mass., Quincy (Ind. br. Boston)—H. T. Dennison, 415 Quincy Shore Dr. will build a 2 story, 70 x 100 ft. service and repair garage. Estimated cost $40,000.

Mass., Roxbury (Boston P. O.)—M. Markovsky, 24 Kenwood St., Dorchester, will build a 1 story, 100 x 215 ft. repair and service garage at Williams and Sterling Sts. here. Estimated cost $75,000. Winebaum & Wexler, 73 Cornhill, Boston, Archts.

Mass., Waltham (Boston P. O.)—The Wal-Grinding Wheel Co., awarded contract for the construction of a 1 story, 50 x 75 ft. addition to factory.

Mass., Waverley (Boston P. O.)—S. Stewart, 145 Beech St., is receiving bids for the construction of a 1 story, 55 x 65 ft. repair and service garage on Trapelo Rd. Estimated cost $40,000. H. T. Underwood, 46 Cornhill, Boston, Archt.

Mich., Detroit—L. Lipson, 1236 Burlinggame Ave., is having plans prepared for the construction of a 4 story, 100 x 175 ft. garage at Palmer and John R Sts. A. Kahn, 1000 Marquette Bldg., Archt.

Mo., Kansas City—F. H. Fitch, 114 West 10th St. awarded contract for the construction of 132 x 248 ft. garage at 1313 McGee St. to Swenson Constr. Co., Shubert Bldg. Estimated cost $75,000.

N. Y., Brooklyn—Packard Motor Car Co., Broadway and 61st St., New York, is having plans prepared for the construction of a 2 story addition to repair and service garage. Estimated cost $80,000. E. O. Holmgren, 371 Fulton St., Brooklyn, Archt.

N. Y., Jamaica, L. I.—Studebaker Corp., 2040 Broadway, New York, awarded contract for the construction of a 3 story, 100 x 210 ft. repair and service garage here. Estimated cost $250,000.

N. Y., New York—Pacific Steel Boiler Corp., 101 Park Ave., awarded contract for the construction of a 1 story, 55 x 75 ft. boiler plant at 141st St. and Southern Blvd. Estimated cost $30,000.

O., Alliance—Alliance Buick Co., Freedom and Prospect Sts., plans the construction of a 4 story, 100 x 120 ft. garage at Linden and Prospect Sts. Estimated cost $200,000. Roberts-Harsh, Columbus, Archts.

O., Canton—C. H. Hoffman, Fulton Rd., East Canton, will receive bids until Oct. 15 for the construction of a 1 story, 98 x 120 ft. garage on South Cleveland Ave., here. Franklin Auto Co., lessee.

O., Cleveland—Forest City Foundry Co., 1200 Main Ave., awarded contract for the construction of a 1 story, 60 x 152 ft. foundry on Maywood Ave. Estimated cost $50,000. Noted Oct. 7.

O., Cleveland—Leece-Neville Co., S. M. Neville, Pres., 5363 Hamilton Ave., awarded contract for the construction of a 1 story, 43 x 100 ft. addition to factory for the manufacture of electric lighting and starting equipment. Estimated cost $40,000. Noted Sept. 30.

O., Cincinnatti—Goldsmith Metal Lath Co., M. S. Goldsmith, Pres. Third and Eggleston Aves., is having plans prepared for the construction of a 1 story, 80 x 300 ft. factory at Orient and Chickering Aves. G. W. Drach, 1701 Union Trust Bldg., Archt.

O., Massillon—Wagner Auto Garage Co., plans the construction of a 124 x 220 ft. garage on East Main St. Estimated cost $100,000 to $150,000.

Pa., Franklin—Chicago Pneumatic Tool Co., Howard St., is having preliminary plans prepared for the construction of a 1 story, 47 x 352 ft. addition to machine shop. Estimated cost $100,000. Private plans.

Pa., McKeesport—Columbia Foundry Co., awarded contract for the construction of a 1 story, 80 x 80 and 20 x 120 ft. addition to foundry. Estimated cost $40,000.

Pa., Philadelphia—Logan Oakland Motor Co., 4718 North Broad St., will soon award contract for the construction of a 3 story, 60 x 178 ft. sales and service station. Thalheimer & Weits, 10 South 18th St., Archts. Noted Aug. 12.

Pa., Philadelphia—M. H. Rochelle, 5726 North Marshall St., will build a 2 story, 60 x 105 ft. garage and service station at Front and Westmoreland Sts. Watts & Coscia, Liberty Bldg., Archts.

Pa., Scranton—F. Wesel Mfg. Co., 70-72 Cranberry St., Brooklyn, N. Y., machinery manufacturers, is having plans prepared for the construction of a 1 story, 200 x 500 ft. plant here. Estimated cost $75,000. Lockwood Greene & Co., 100 East 42nd St., New York, N. Y., Archts.

Tenn., Chattanooga—American Hoist Co., Main St. and Belt R.R., plans the construction of a plant. Estimated cost $100,000.